VEGETATION INVENTORY UPDATE

Strategy Report

Prepared by

Vegetation Update Task Team

Ministry of Sustainable Resource Management

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EXECUTIVE SUMMARY

This report was prepared by the Update Task Force for the senior management of the Registries and Resource Information Division (RRID) of the Ministry of Sustainable Resource Management (MSRM) as a tool to aid in the development of a new Vegetation Resources Inventory forest cover file update strategy. It examines the Vegetation Resources Inventory file "Update" process within the context of updating selected spatial and descriptive attributes that change due to natural and human activities as required by the Update Business Drivers.

Current Assessment of Update

The Vegetation Resources Inventory (VRI) forest cover data is not a snapshot in time. It is a constantly changing picture of the resource. It is important to maintain the VRI even with the workforce adjustment that is taking place as the Update produces current information that provides decision makers with confidence with the information.

The current (pre March 31, 2003) Update process involves over 50 staff in 28 locations across the province. The staff is located at 21 forest district offices, 6 MSRM regional offices and in the Terrestrial Information Branch. Update data comes from numerous sources including the forest industry, oil and gas commission, and other government agencies. Table A summarizes the current state for Update.

Table A: Current State for Update

	Source Information	**Reporting**	**Validation / Audit**	**Update** (Depletion / FTG / Natural Stands)	**Distribution**
Current State	Licensees: Provide information in an adhoc manner.	Spatial: Adhoc Attribute: ISIS/ Results when available	Adhoc by District or Region	INCOSADA	IODM replicated in Regional Servers Cumbersome
Resourcing	30 FTE's			20 FTEs	
Total Annual Cost	$3,000,000				

Update Business Environment

The Update environment is fluid and evolving. The process for updating information is driven by the ever-changing demands of statutory and policy requirements, client needs, in terms of both specific data requirements and currency of information, and technological advances that can affect both how and what information is collected. The message repeated in the canvassing of clients was that the VRI update is a critical information source to meet their business requirements. This includes the business needs of industry, First Nations, government agencies and the public.

The Update process can potentially take advantage of several emerging policies and technologies. Opportunities to re-tool the Update process include linking into RESULTS (Results Based Code Silviculture and Landstatus Tracking System), refocusing the service centre model and integration of the update information. In addition, industry is keen to work in an environment where update information can be provided in an effective and consistent manner and they only have to provide that information once.

Options for VRI Update

The four delivery options reviewed for VRI Update are listed below. (See Appendix A for a detailed summary of these options and Chapter 4 for a discussion of pros and cons of each model.

Option 1: MSRM Business Model with 12 Staff

Option 2: Government Stewardship Model (Industry/MSRM partnership using RESULTS)

Option 3: Industry Stewardship Model

Option 4: No Update

Recommendations

Short-Term (Transition)

Recommendation 1: During fiscal 2003/04 proceed with Option 1 with a priority of meeting the Timber Supply Review Schedule (refer to Appendix G).

Medium to Long Term Option

Recommendation 2: The Update Task Team recommends Option 2 as the desired option for the long-term model as it meets the TOR requirements and will address industry concerns for preparing and submitting the data only once.

Location and Delivery of MSRM Resources

In this strategy report four models for the location and organization of MSRM resources are discussed. These four models are described below:

Dispersed Model. This option assumes that vegetation update staff will work in a dispersed organization in either a forest district office or in an MSRM regional office. MSRM has shown that the updating of the vegetation changes can work in a dispersed (forest district oriented) model.

Two Service Centre Model. This option assumes that vegetation update staff will work in two service centres, specifically, Kamloops and Prince George.

One Service Centre Model. This option assumes that all vegetation update staff will work in one Service Centre.

Private Sector Model. This option assumes that all vegetation update be done by the private sector.

Recommendations

The two service centre model (Kamloops and Prince George) is recommended for implementation.

Digital Data Integration Options

The digital data integraton was considered as a sub-set of Option 2 (above). In Option 2, data will be supplied by industry through RESULTS. MSRM or the private sector will need to complete the integration and capture of the free growing and natural disturbances. Regardless of the option chosen for electronic data capture, MSRM will need to provide the resources or Update will not be completed. The information that is produced from the integration process will be placed in the data warehouse by MSRM. The three options for the electronic transfer of data are outlined below:

Option A: Contract out the Process

Option B: MSRM Develop Tools and Implement

Option C: MSRM Develop Tools and Private Sector to Implement

Recommendations

There was no consensus on how to cut in of the digital file. We recommend having this resolved by a small focused team and to report within two weeks of the report being submitted. The team

should consist of a VRI specialist, Update specialist, database specialist and a systems specialist and led by the Task Team Chair.

Implementation Milestones – Next Steps

The implementation of the desired update model has been considered with the context of the TOR for the Update Task Team. Implementation milestones have been developed and are as follows:

Milestone	Responsible	Timeline
Default to Option 1	MSRM	2003/04
Report Submitted to Directors (decision pending)	MSRM	Mar 26, 2003
Reorganization of MSRM to deliver the selected option	MSRM	June 2003 to 2005
Project plan developed for backlog and natural disturbances	MSRM	June 1, 2003
Rules developed for integration of RESULTS data onto vegetation inventory	MSRM	June 15, 2003
RESULTS operational	MoF	Aug 1, 2003
Monitoring and Auditing process developed for the vegetation update process	MSRM	Dec 2003
Update for Backlog completed	MSRM	TBA
Update for Natural disturbance completed	MSRM	TBA
RESULTS is fully functional and sustainable with a Harvest Depletion and FTG focus	MoF	April 1, 2004
Integration procedure developed, tested and operational	MSRM	Sept 2003 to June 2004

ABBREVIATIONS AND DEFINITIONS

CMT	**Change Management Tile** Data structure created in several district offices around the province and used to track changes to the vegetation inventory. It typically does not carry full vegetation attribution.
FRPA	**Forest and Range Practices Act**
FSWG	**Forest Stewardship Working Group**
ESF	**Electronic Submission Framework** System by which data is received and distributed to specific business areas. To be used for all data submissions to the Ministry of Sustainable Resource Management (MSRM). (Currently under construction)
FG	**Free Growing**
INCOSADA	A standardized set of corporate spatial and attribute data (i.e., map and text data) with common database structures and a suite of tools to support file update and management including the tools currently used for Vegetation Inventory Update
IODM	**INCOSADA Object Distribution Manager** System that manages the over 8,000 vegetation inventory maps for the INCOSADA tool.
LRDW	**Land and Resource Data Warehouse** Data base under development that stores and distributes land information, predominantly for analysis.
QA	**Quality Assurance**
RESULTS	System being constructed by the Ministry of Forests to manage silviculture information. This is intended to replace ISIS and MLSIS reporting systems.
SDE	**Spatial Database Engine** A database that allows read and write access to the Vegetation Inventory utilizing a technology that allows graphical information to be stored and manipulated in the same database as the attribute information.
TIB	**Terrestrial Information Branch** Ministry of Sustainable Resource Management
TSB	**Timber Supply Branch** Ministry of Forests
TSR	**Timber Supply Review**
Update	**Vegetation Resources Inventory (VRI) Update** For the purposes of this report Update refers to the update of the forest cover spatial and descriptive attributes of the VRI file.
VDYP	**Variable Density Yield Program** Tool to "grow" various forest attributes into the future and predict volume.
WLAP	**Ministry of Water, Land and Air Protection**

TABLE OF CONTENTS

Executive Summary i

Abbreviations and Definitions v

Table of Contents vi

1. Introduction 1

2. Current Assessment of Update 4

2.1 Change Management Tile Process 5

2.2 Southern Interior Update Pilot 6

2.3 Change Detection 7

2.4 Update Policy and Standards 7

2.5 Currency of the Data Sets 8

3. The Update Business Environment 9

3.1 Business Drivers 9

3.2 Emerging Policy and Technologies 9

4. Strategic Analysis of Delivery Options 12

4.1 Option 1: MSRM Business Model with 12 Staff 12

4.2 Option 2: Government Stewardship Model 15

4.3 Option 3: Industry Stewardship Model 17

4.4 Option 4: No Update 20

5. Location and Organization of MSRM Resources 22

5.1 Dispersed Model 22

5.2 Two Service Centre Model 24

5.3 One Service Centre Model 25

5.4 Private Sector Model 26

6. DigiataL Data Integration 28

6.1 Option A - Contract out the integration 31

6.2 Option B - MSRM Develop Tool and Implement 31

6.3 Option C – MSRM Develops the Tool, Private Sector Implementation 32

7. Implementation Recommendations 34

7.1 Short-Term (Transition) 34

7.2 Medium to Long Term Option 34
7.3 Staffing Model 35
7.4 Digital Data Integration 36
7.5 Implementation Milestones – Next Steps 36

Appendix A: Detailed Summary Tables For VRI Update Options 38

Appendix B: Task Team Membership 41

Appendix C: Terms of Reference 42

Appendix D: Change Management Tile 45

Appendix E: Change Detection 46

Appendix F: Data Currency Survey Results 48

Appendix G: Business Drivers for Update 50

Appendix H Inventory Spatial Update Audit 52

Appendix I: Information map from RESULTS to Upsate 54

Appendix J: Electronic Transfer of Data 55

Appendix K TSR Update Schedule 58

Appendix L: Industry Response to Option 2 60

1. INTRODUCTION

This report was prepared for the senior management of the Registries and Resource Information Division (RRID) of the Ministry of Sustainable Resource Management (MSRM) as a tool to aid in the development of a new Vegetation Resources Inventory forest cover file update strategy. Information for this report was provided from members of the Vegetation Update Task Team (see Appendix B). This Task Team consists of participants from the Ministry of Forests' (MoF) field operations and Information Management Group (IMG) and MoF Timber Sales, MSRM regions and Terrestrial Information Branch (TIB) and Information Management Branch (IMB) and representatives of the forest industry. Task Team Terms of Reference can be found in Appendix C.

The objective of this report is to examine the VRI file update process within the context of updating selected spatial and descriptive attributes that change due to natural and human activities, as defined by the Update Business Drivers.

To meet the budget targets set by the government, MSRM is reducing the resources dedicated to maintaining the vegetation forest cover update file by 75 percent keeping 12 FTEs distributed between headquarters, regions and districts.

Major clients, such as the forest industry and the Ministries of Forests and Water, Land and Air Protection (WLAP), have indicated strong support for keeping vegetation cover files current. In addition, several statutory processes rely on a reasonably current vegetation inventory, including the Chief Forester's Annual Allowable Cut process and the government's Strategic Land Use Planning decisions.

Government has also asked agencies to reduce duplication and redundancies wherever possible. Many forest sector interests have indicated that much of the data captured by government for maintenance of the vegetation cover files is a duplication of information requests made by other government agencies, and in some cases the capture of data is not necessary. Clearly the previous vegetation update process is not sustainable.

The Ministry of Forests has introduced a new Results Based Forest and Range Practices Act (F&RPA) that includes a new silvicultural reporting tool called RESULTS (Results Based Code Silviculture and Landstatus Tracking System). This reporting tool will have many of the same basic elements of the old silvicultural reporting tool (ISIS/MLSIS) and has been enhanced to include a spatial component. It is anticipated that this new tool will be used to report on forest tenure holders' accomplishments. While the cost to industry is not known at this time, MSRM believes that there are enough common linkages that government can create synergy by utilizing the RESULTS reporting to help update the vegetation cover files.

At this time, the MoF and MSRM are anticipating that the forest industry will be able to effectively use the RESULTS process, which would help avoid duplication in capturing and

reporting on changes to the vegetation cover files. This creates an opportunity to efficiently maintain the vegetation cover files.

Definition of Update

Update relates to changes to the Vegetation Resources Inventory (VRI) and includes "managing" these three "business" units (sub-populations):

- Natural Stands - when the vegetation cover changes due to natural factors (i.e., fire, disease, insects, and succession);
- Managed (post free growing) Stands - free growing (FG); and
- Harvested (harvested through to free growing) stands.

To retain the integrity of the inventory, all three of the above sub-populations need to be considered and maintained.

Assumptions

The assumptions used in developing the Update Strategy are that:

- industry collects most of the information required to meet update business needs (due to regulatory requirements);
- the model must not duplicate other reporting requirements;
- the model must provide timely access to the updated data;
- the model must not significantly alter the delivered data;
- government will retain resources to meet timber supply review (TSR) vegetation data needs on Timber Supply Areas (TSAs) in 03/04;
- until otherwise instructed, Tree Farm Licences (TFLs) will continue to deal with update status quo;
- the update data requirements related to harvest activities can be managed under a single process (RESULTS). RESULTS will supply spatial and attribute information. The associated workload for the industry is unquantified at this time and needs to be articulated;
- electronic data transfer is supported for RESULTS transactions. There will be a phase-in and this will be in concert with the Timber Harvest and Silviculture Practices and Regulations; and
- the INCOSADA suite of tools currently used by MSRM will not be available after September 2003 and an appropriate substitute will be in place.

Deliverables

Based on the Task Team's Terms of Reference, this report includes a number of options for the VRI update process. These options take into consideration:

- business needs (including the functions of data collection, verification and audit);

- respective roles of the licensee and government resources to meet known business needs;
- standards (input and validation) and subsequent policy that may need to be developed;
- risks/benefits resulting from options that transfer more responsibility to the private sector;
- alternatives to the current process that would allow for more private sector responsibility or increased government risk thereby freeing up government resources for other priorities;
- location and organization of government (MSRM) human resources (ranging from status quo to multiple service centres to one location);
- a recommended course of action; and
- a transition strategy that includes training, human resource issues and budgets.

2. CURRENT ASSESSMENT OF UPDATE

The Vegetation Resources Inventory forest cover data is constantly changing. Users of forest cover information have developed unique models or processes that allow for the extraction, use and update of data that is of particular interest to them. The methodology for update do not change significantly between government and industry. Update processes include: Incosada VRI, the Change Management Tile process, Change Detection and the Southern Interior Update Pilot process. Also worth examining are the issues of data currency and the present policy environment.

The current (pre March 31, 2003) VRI forest cover file update process involves over 50 staff in 28 locations across the province. The Update staff that collect attribute and spatial information for updating and maintaining the VRI file are located at 21 forest district offices, 6 MSRM regional offices and in the Terrestrial Information Branch. The data comes from numerous sources including the forest industry, oil and gas commission, and other government agencies.

Update staff extract data using various tools, such as forest development plans, global positioning satellite information, remote sensing products (air photos, ortho-photos, satellite images), and from a variety of ground samples. The data is assimilated and translated onto VRI spatial and attribute databases by update staff and sent electronically to the Terrestrial Information Branch of MSRM.

Since remote sensing products, such as LANDSAT-7 images, are an important tool for many different resource users, the acquisition of these products is often done within a partnership of the forest industry, MSRM, MoF and WLAP. The costs are shared across the partnership.

Staff at TIB ensures that the data is clean and meets current standards before incorporating the updated inventory information into the VRI files. The updated VRI information is then made available to government and industry decision-makers and other clients for use in their strategic and operational needs. The simplified process flow can be found in Table 1: Update Process flow for Current State.

Table 1: Update Process Flow for Current State

	Source Information	Reporting	Validation / Audit	Update (Depletion / FTG / Natural Stands)	Distribution
Model	MSRM Current State Model				
	Licensees: Provide information in an adhoc manner.	Spatial: Adhoc Attribute: ISIS/ Results when available	Adhoc by District or Region	INCOSADA Tools	IODM replicated in Regional Servers
Current Issues (Update staff juggle these to deliver a product.)	Inconsistent - Multiple licensees - Multiple formats - Multiple standards	Variable - Spatial as paper & digital - Attribute incomplete in ISIS -Not Current	Difficult - Lack of a consistent format & imagery - Duplication (needed information not always available in provincial reporting)	Incomplete -Technological direction (INCOSADA is not compatible with SRM direction/ SDE) - Only depletion is being managed	Cumbersome - Multiple formats (ARC & IGDS)
Resourcing	50 FTE's				
Opportunities				Retained a minimal core skill set.	
Cons	Currently no single workable process across the province				
Risks	▪ Have lost trained staff. ▪ Assumes 'RESULTS' will reconcile all these tasks. ▪ Puts at risk of achieving MSRM Goal 2 objectives (failure to provide scientifically credible information in a timely manner)			May not be able to undertake all functions (FG and Natural stands).	Does not address industry and other clients (e.g. chief forester) needs for access to current updated information in a timely manner.
Total Annual Costs	$3,000,000				

2.1 Change Management Tile Process

A Change Management Tile Process (CMT) containing spatial information relating to harvested areas (i.e., silviculture openings) is currently used for VRI update in the Omineca

Peace Region and in parts of the Skeena Region. Both regions currently use MicroStation/Maps3D tools compatible with INCOSADA.

Business processes related to the digital standards associated with the CMT still need to be clearly defined for implementation at a provincial scale. These include standards relating to the creation of the CMT, and database linkages between the CMT and Silviculture Information Access (SIA). The methodology that could be used to update the vegetation inventory attributes to reflect changes monitored with the CMT also still need to be fully investigated and resolved. Additional information on the CMT can be found in Appendix D.

2.2 Southern Interior Update Pilot

The Southern Interior Update (SIR) Pilot was developed to test the incorporation of the cutblock information maintained by the licensees into the VRI file. The licensees were responsible for providing this information correctly geo-referenced. The hope was that duplicate information generation would be reduced and that MSRM could take advantage of including this information as part of the VRI update process.

Lessons learned

The SIR Pilot provided several lessons as follows:

1. There has been an ongoing problem of identifying a harvest depletion source that is within the required tolerances (90 percent of boundary within ±20 metres).
2. Without a validated source the depletion process can become iterative. This is a costly process, as it requires many re-visitations to the same polygon.
3. Focus of inventory on the depletion update vs. addressing both FTG and maintaining natural stand attributes.
4. There is a need to develop provincial translator/submission broker with forest management systems such as GENUS or INFORM.
5. There is a need to define business standards for the inventory update/management in a Spatial Database Engine (SDE) environment. (The implication of this is that the outstanding legacy business issues left over from INCOSADA will be considered within this initiative).
6. There is a need to define how the new MSRM inventory role may be achieved in a SDE/GIS/FMS environment.
7. There is a need to link into the "Land Resource Data Warehouse" (LRDW) initiative currently in progress (led by Information Management Branch).

Information gained from the SIR Pilot, including information flow and process from the private sector to government, was incorporated into the considered options where appropriate. For additional information on the SIR Pilot, please refer to *SIR Forest Inventory Update Procedure* - Version 5, Porcheron, Sapinsky, *et al.*)

2.3 Change Detection

Change Detection is a process utilizing remotely sensed data of different dates to provide a composite image that highlights areas of change. It can provide an efficient and cost effective aid for Update. The Change Detection outputs are easy to use, work within either a Microstation or ArcGIS environment and can provide TSA-wide coverage. It provides a disturbance shape, but does not provide any history or silviculture attributes. With decreasing human resources and capacity in update staffing, the change detection process can help streamline and reduce the workload of spatial forest cover updating. The Change Detection process has been piloted for Update and used for auditing in selected TSAs. Refer to Appendix E for additional information on Change Detection.

2.4 Update Policy and Standards

The goal for timeliness of the updated data has been to keep the inventory no more than two years out of date. Discussions with MoF Field Operations, BC Timber Sales, and industry have clearly stated that this is not sufficient for operational use of the data. Operational forest clients would prefer that the inventory be no more than one year out of date. Reasons for this can be seen in the review of business drivers (Appendix G).

MSRM staff have had mixed success trying to meet this target. Some files are updated frequently enough to be current while there is great difficulty in meeting the two-year timeline for other files. This was due, in part, to district staff being assigned to other duties (Exhibit A production, map reproduction and other related duties) and not being able to focus on update.

The standards for VRI update are the standards in place for the photo estimation of VRI attributes. These standards are Photo Interpretation Procedures Version 2.4 March 2002 and are available at:

http://srmwww.gov.bc.ca/tib/veginv/publications.htm

The standards for capture of digital mapping follow the TRIM mapping standards for accuracy of ±10 metres 95 percent of the time. These standards are available at: http://srmwww.gov.bc.ca/bmgs/trim/trim_specs.html

As there have been a number of processes to capture update information, there has been a great deal of difficulty in maintaining or even attaining a standard for the province. This is reflected in the review of update processes (Appendix F) across the Forest Regions.

Audits of the accuracy and currency of the vegetation cover have been done in an ad hoc process. This is primarily driven by the regional update staff. The audit process is described in Appendix H.

2.5 Currency of the Data Sets

A provincial survey on the methodologies used to update the vegetative cover in each of the districts and planning units was conducted (see Appendix F). This information illustrates the current process and will assist in the development of a transition plan to the new Update Strategy.

An analysis of the survey information indicates that:

1. Even though standards have been in place for many years, they have not been consistently applied across the province.
2. Current practice for the update staff is to update the VRI file at milestones that meet the client's needs. This practice has not been applied with any consistency across the province, or in some cases, within a TSA.
3. The current policy has been to update the vegetation file bi-annually. Evidence shows that the frequency of the update varies from continuous, to bi-annual, to meeting TSR timelines. Meeting the TSR timelines has often been a one-time, non-standard capture of the changes to the VRI file. The resultant file has considerable risks and uncertainties. It has typically only been used in the TSR process and doesn't provide an accurate source for corporate update of the VRI file.
4. Update of the VRI file can be done in a dispersed model or in some form of a service centre model.
5. Despite the increasing use of digital data, there is a continuing reliance on non-digital source data. This suggests that any transition plan needs to develop a process to move from non-digital source data to digital source data.
6. Different data capture tools have been used as a consequence of current resource allocation. Each of these tools has a different positional accuracy for capturing the vegetation changes.
7. Although there were standards for capturing spatial attributes (Total Area Under Prescription), the capture of the spatial attribute varied across the province. This may be due to differences either in the interpretation of the standard or in the application of the standard.

3. THE UPDATE BUSINESS ENVIRONMENT

The Update environment is fluid and evolving. The process for updating information is driven by the ever-changing demands of statutory and policy requirements, client needs (in terms of both specific data requirements), currency of information, and technological advances that can affect both how and what information is collected.

3.1 Business Drivers

The VRI is a critical information source for a variety of clients to meet their business requirements. Clients were canvassed to determine their current usage of VRI and how it would address their business requirements. The information gathered in the update process must be sufficient to meet these client needs. The business needs of industry, First Nations, government agencies and the public is summarized in Appendix G. The currency of the data was determined from feedback of the clients (Appendix F) and regulatory requirements.

Provincial Acts, regulations, government polices, international market pressures, certification, and operational and environmental issues drive the need for the gathering of forest resource information. Many clients stressed that the update of the VRI was critical to their ongoing operational needs. The utility of the data depends on establishing science-based standards, eliminating duplication, having current information, and providing timely, accurate and reliable information to clients. This supports government's strategic goals specifically within Goal #2 of the MSRM 2003-2006 Service Plan. Furthermore, having one agency responsible for the storage, quality, and accessibility of the data is a more efficient model as compared to having these responsibilities reside within a variety of agencies and/or industry.

3.2 Emerging Policy and Technologies

There are several emerging policies and technologies that the Update process can potentially take advantage of. Potential opportunities to retool the process range from consistent reporting to a change in focus for Timber Supply Area analysis. This section discusses some of the changes that have or are likely to occur within the next twelve months. These include the Spatial Database Engine, Electronic Submission Framework, RESULTS, the Working Forest Policy and Defined Forest Area Management.

Spatial Database Engine

Both industry and government are searching for more effective, efficient business relationships and process. The Forest and Range Practices Act seeks to represent this and thereby provides an opportunity to retool business processes and develop more effective areas of responsibility. The increasing maturity of the Internet, bandwidth software and the

progressive standardization of the business provide a solid framework for technological solutions to business processes such as update.

The Spatial Database Engine (SDE) in concept is a large storage system. The SDE will facilitate the collection of spatial and attribute information from multiple sources. In addition the SDE process will facilitate the access of the database and works especially well in a Web-based environment.

The forest management discipline has been a longstanding user of spatial information systems such as GIS. However this has not been standardized at any level provincially, which has presented onerous problems for the Update process in terms of data capture and spatial data management. The development of SDE-based forest information systems appears to be emerging as a standard with licensees holding 58 % of provincial AAC within one system (Genus). This may offer a tremendous opportunity to integrate MSRM business needs within a limited number of forest information systems. The development of a RESULTS-based reporting system is an excellent example of this.

Electronic Submission Framework

Government is moving towards an E-commerce strategy that will include providing a means for clients to do business with government in an electronic format. This includes conducting business over the Internet. The submission of information and access to information in an electronic format is expected to reduce costs to both government and to industry.

RESULTS

Results Based Code Silviculture and Land Status Tracking System (RESULTS) will be an enhanced and streamlined replacement of the Integrated Silviculture Information System (ISIS), and will be the new information system to track, report silviculture accomplishments and analyze progress on free growing obligations. The application is based on the new business requirements for the Forest and Range Practices Act. It is a Web-based tool to assist the MOF in achieving core service plan goals, including the management requirements and responsibilities around corporate silviculture information. These include the pre-approved stocking standards (Form A), the record of harvesting or silviculturally treating an opening (Form B), the forest cover attributes with accompanying map, and the declaration of achieving post harvest, regeneration, and free growing obligations (Form C).

Submitting electronic information to RESULTS is part of the overall government objective in developing and implementing an electronic commerce, Internet-based framework for receiving information from outside government. Therefore, a key intention of the RESULTS project is the facility to receive spatially enabled (i.e., capturing mapping line work) silviculture data from all silviculture information providers. RESULTS will specify a silviculture data submission format based on industry standards (i.e., GML and XML), validate the submitted data, and authenticate the source submission.

For those submitting silviculture data, RESULTS will provide an Internet-based viewing and updating capability of the data, as well as provide a complete audit trail of submitted silviculture data. Information in RESULTS can be easily reported on and accessed by licensees and others that are required to submit silviculture information. Through legislation, the RESULTS application must be in place by July 31, 2003.

Information mapping from RESULTS to the vegetation cover for update is presented in Appendix I

Working Forest

British Columbia is currently developing a Working Forest Policy. It is defined as all Crown forest land in the province that is outside of protected areas and parks. By clearly defining the Working Forest, the government hopes to:

- increase certainty about the land base;
- make administration of Crown forest land more efficient; and,
- balance economic priorities with our need for conservation and stewardship.

Information about the Working Forest will be needed to support both decision-making for and the administration of the Working Forest. The government will require information and analysis to monitor trends, evaluate the effectiveness of the designation, and to track economic activity in the Working Forest over time.

The linkage between the Working Forest and the VRI file is undetermined at this time. More information on the Working Forest can be found at:

http://srmwww.gov.bc.ca/rmd/workingforest/

Defined Forest Area Management (DFAM)

The proposed Ministry of Forests' policy on DFAM is designed to ensure that forest and range resources are protected and improved on a sustainable basis. The policy would require the forest companies to take on the responsibility for analytical and public/First Nations information sharing components of timber supply review, and forest health related issues.

A joint industry and government ad hoc Forest Stewardship Working Group (FSWG) is reviewing issues surrounding inventory and information management in general. These outstanding issues may have a bearing on the future design of the vegetation update process and implementation.

4. STRATEGIC ANALYSIS OF DELIVERY OPTIONS

There are a number of delivery options available for Update. The following discussion will outline four options and the associated opportunities, costs and risks. It is assumed that the INCOSADA suite of tools currently used by MSRM will be phased out as a suitable replacement tool set is developed. In addition, it is also assumed that in the short to medium term, not all forest tenure holders will have the same capacity to track and maintain the changes to the VRI file. In each case there is a need for a transition plan to bring all the players into the game but the extent of the plan will vary. This is tied directly to the transition plan for RESULTS.

Note: *Forest licensees have indicated that they do not want RESULTS to become a black hole in which data goes in and nothing can be accessed. They would prefer access to the data once it is in the system. RESULTS is designed so that licensees can access the data they put into the system. The licensees have also indicated they want access to the resultant VRI data set. MSRM could recognize that we have entered into a partnership with the forest industry and formalize the relationship. In this case, as a partner industry would be entitled to access the approved VRI data. The data exchange agreements are intended to meet this need. A cautionary note here is that feedback from industry indicates that the current MSRM data exchange agreement is too long and onerous. As such, it will need to be simplified.*

Government agencies have also expressed a need to be able to access the approved VRI data sets without charge. They use this data set to make their decisions on the land base.

4.1 Option 1: MSRM Business Model with 12 Staff

(12 technical staff plus a manager)

Option 1 is Update led by MSRM. It is characterized by:

- switching from ISIS/MLSIS to RESULTS when available;
- focusing on harvest disturbance and managed stands, backlog free growing (FG) update with continued limited focus on natural disturbance;
- assuming that Update occurs independently of RESULTS;
- maintaining the current Update process, using INCOSADA and the Change Management Tile, where MSRM staff collects the appropriate text and spatial attributes from licensees and produces the update layer; and
- incorporating the changed attributes into the VRI files, thereby replacing the previous version of the VRI file and becoming the approved VRI file.

Further clarification of the role of branch and regional staff will need to be discussed in a transition plan.

Option 1 pros, cons, risks, policy needs and training requirements are listed below. See Table 2 for a summary of this information along with information on resourcing and costs.

Pros

- A reduced direct cost to government due to the 75 percent reduction of staff.
- Trained staff exist (albeit a much smaller number than a year ago) who know and understand the database and how to use the existing suite of tools to maintain the VRI change layer.
- Data would still need to be captured in part by the forest tenure holder, which is currently being done.
- There would be a single business process for the province.
- There would be no net new costs to industry for supplying update source information.

Cons

- This option will not meet business requirements for Update, nor will it meet MSRM's Goal #2 in its 2003/04 Service Plan.
- This option will only be able to meet the Timber Supply Review's schedule for Update.
- The reduced Update cycle will mean an increase of per unit cost for Update.
- Option 1 will need to develop processes to work with the Change Management Tile.
- With an inventory that does not meet business requirements for currency, it rapidly deteriorates. The increased uncertainty in the information will increase the risks to industry and provincial and federal government statutory decision-makers.
- There will be duplication of data created by industry and government.
- The forest tenure holders would continue to carry unnecessary costs due to duplication of attributes being requested by government.

Risks

- Potential alienation of clients such as MoF Operations, B.C. Timber Sales, other government agencies and industry who would like to see priorities linked to operational requirements in addition to the TSR schedule.
- Increased uncertainty in the information being used for statutory decisions.
- The maintenance of the VRI data set becomes tenuous while the risks and uncertainties associated with the VRI file increase dramatically for users of the data. The longer this goes on, the more pressure would be placed on the need for a re-inventory that will inevitably have higher costs.

Policy Needs

Policy needs would include:

- Relaxing informal policy on update cycle from two to five years.
- Providing policy direction on acquiring data from licensees.

Training

There are no immediate training requirements.

Table 2: Update Process Flow for Option 1

	Source Information	Reporting	Validation / Audit	Update (Depletion / FTG / Natural Stands)	Distribution
Model	< "MSRM Business Model (pre RESULTS)" > (Initiative delivered by MOF) No net cost increase – above that of implementing RESULTS.			< SDE Tool >< LRDW > (SRM)	
	Licensees: Provide information in an ad hoc manner.	Spatial: Ad hoc Attribute: ISIS/ RESULTS when available	Ad hoc by Region	INCOSADA Tools	IODM replicated to LRDW
Current Issues (Update staff juggles these to deliver a product.)	Inconsistent - Multiple licensees - Multiple formats - Multiple standards	Variable - Spatial as paper & digital - Attribute incomplete in ISIS	Difficult - Lack of a consistent format & imagery - Duplication (needed information not always available in provincial reporting)	Incomplete -Technological direction (INCOSADA is not compatible with SRM direction/ SDE) - Only depletion is being managed	Cumbersome - Multiple formats (ARC & IGDS)
Resourcing	13 FTE's (Resourcing reduction in 03/04 downsizing)				
Opportunities	To develop a standardized, validated, auditable process			Retained a minimal core skill set.	
Cons	Currently no single workable process across the province				
Risks	• Have lost trained staff. • Assumes 'results' will reconcile all these tasks. • Puts at risk of achieving MSRM Goal 2 objectives (failure to provide scientifically credible information in a timely manner)			May not be able to undertake all functions (FG and Natural stands).	Does not address industries need for access to current updated information in a timely manner.
Cost	$360,000		$150,000	$210,000	$60,000
Total Annual Cost	$780,000				

4.2 Option 2: Government Stewardship Model

Option 2 is an Industry/MSRM partnership Update using RESULTS. It reflects the desired future state and is characterised by:

- industry completing the data collection for man-made harvesting related disturbances;
- RESULTS and the Electronic Submission Framework (ESF) being implemented and used by all forest tenure holders;
- RESULTS submissions not being changed within the VRI file;
- MSRM updating and completing the data processing and data integration annually for natural stands;
- MSRM monitoring and auditing data that comes from RESULTS;
- MSRM setting standards for update with input from industry partners; and
- MSRM making sure that the updated VRI file is available for use by government decision-makers and third party clients.

Note: *In this option, MSRM will likely be able to meet the requirements to capture the backlog FTG and the catastrophic natural disturbances with the expected reduced level of the resources within the VRI Update activity.*

Option 2 pros, cons, risks, policy needs and training requirements are listed below. See Table 3 for a summary of this information along with information on resourcing and costs.

Pros

- Forest industry tenure holders will be free to develop, purchase or use their existing tools for capturing the changes to the VRI that meets their particular business needs
- With incentives, there are further stewardship opportunities for industry to provide natural disturbance update data collections.
- MSRM sets update standards with input from industry partners.
- Promotion of free enterprise as there is evidence that private sector consultants are interested in capturing a piece of the update business.
- For some natural disturbances there is an opportunity to create a partnership with other groups such as the Fire Centres of the Forest Protection group. The Fire Centres would capture the changes to the VRI layer due to fires and send them to MSRM.
- Other partnerships could be explored to capture man-made disturbances created by third parties other than the forest tenure holders.
- MSRM has appropriate staffing at the operational level to be successful in the validation, auditing and updating for backlog free growing and catastrophic natural disturbance.
- Free access to updated inventory information may provide a cost off-set to industry implementing RESULTS.

Cons

- During the early part of the MSRM Transition government resources will be stretched thin until this option is fully implemented.
- MSRM will not have the resources to update for non-catastrophic natural disturbances and non-harvesting man-made disturbances.
- As a consequence of implementing the spatial nature of RESULTS, industry will experience an increase in reporting costs.
- Unless required by legislation or by contractual obligation, the forest tenure holders will want to be compensated for the increased costs of capturing the other non-harvesting, man-made disturbances as well as the natural disturbances. The dollar value of this is unknown at present.
- MSRM will have to budget for and create a linkage between RESULTS and the MSRM VRI file. (There are three options presented under the section titled *Electronic Transfer of Data*,)
- There is no compelling evidence indicating that MSRM will need fewer resources than is currently forecasted for the 2003-2004 fiscal year.

Risks

The major risks under this option are:

- uncertainty of the delivery and implementation of RESULTS; and
- this option will need to be re-tooled should the reporting requirements for RESULTS differ from what has been outlined as required for Update,.

Policy Needs

- This option is tied directly to the Forest and Range Practices Act currently being defined by MoF in their new legislation. This will require that licensees use RESULTS to report on harvest related depletions. Investigation of a policy to transfer RESULTS information to MSRM needs to be explored.
- MSRM will need legislation to require industry to collect the information to the standards required for VRI Update.
- MSRM will need to develop policy allowing third party access to the MSRM data warehouse.
- In addition there needs to be some recognition of a transition for industry to use RESULTS and how we will bring the industry into the new era.

Training

MSRM will need to train clients and staff on the new business process changes and associated tools.

Table 3: Update Process Flow for Option 2

	Source Information	Reporting	Validation / Audit	Update (Depletion / FTG / Natural Stands)	Distribution
Model	< " Government Stewardship (With RESULTS)" > Initiative delivered by MOF. No net cost increase ~ above that of implementing RESULTS.			< SDE Tool >	< LRDW >
Resourcing	0 FTE's			13 FTE's	
Opportunities	▪ Industry completes/maintains data collection. ▪ Emphasizes the need for and benefit of an agreed to industry/government standard.			SRM focuses on update task. Update reported annually.	If access is free, this would address industries data access concerns.
Cons	Licensees concerned about additional costs (part of discussion on results (MOF lead).			"Cut in" tool required	Data Share Agreement required
Risks	In the absence of 'results' the sourcing of a valid spatial component continues.			Ability to complete all functions (risk less here than in other options)	
Cost Estimate	There is an overall reduction in government resourcing if RESULTS (with spatial) is implemented. Development of business tools $250,000 Audit and Naturals $720,000 (12 fte) Industry cost to supply digital spatial and attribute Information: Unknown				$60,000 (1 FTE)
Total Annual Cost	$780,000 annual + $250,000 one time cost				

4.3 Option 3: Industry Stewardship Model

Option 3 is Update-led and completed by industry. It is characterized by:

- industry completing data collection, data processing and data integration for update of harvested openings over a defined forest area;
- MSRM receiving a number of updated inventories for forested areas, which when "stitched" together provide a complete provincial coverage;
- MSRM having a role in monitoring and auditing;
- MSRM setting standards for update with input from industry partners; and
- MSRM providing storage and access to the provincial coverage to government, industry, and the public.

Option 3 pros, cons, risks, policy needs and training requirements are listed below. See Table 4 for a summary of this information along with information on resourcing and costs.

Pros

- MSRM no longer maintains the update for the VRI.
- MSRM migrates to an auditing role to ensure the VRI maintenance meets the published standards.
- There would be a reduction in the duplication of effort.
- The forest industry tenure holders will be free to develop, purchase, or use their existing tools for capturing the changes to the VRI that meet their particular business needs.
- There would be negotiation with the forest industry as to their role in update for natural and non-forest sector disturbance capture.

Cons

- There is no compelling evidence indicating that MSRM will need fewer resources than is currently forecasted for the 2003-2004 fiscal year. Resources would be reallocated to merging files across the province.
- There is a difficulty and cost associated with involving all licensees (forest and other) to create a consortium to manage the inventory.
- There is no overall reduction in cost for this option for either government or the private sector.
- There is a cost increase to the licensees under this option and they may also incur increased costs if they have to maintain duplicate data.
- Integrating files from a variety of data sources with different formats will be difficult and costly to manage.

Risks

The risks for Option 3 are as follows:

- There will be limited ability to enforce the standards.
- The varying quality of the current Update will introduce an inequity to industry. The quality depends on a variety of factors, including audits, currency, design of the inventory and the relevance of the inventory in relationship to the client needs. In order to transfer the forest cover inventory to licensees in an equitable manner, a minimum forest cover inventory standard needs to be described so that some licensees will not be unduly burdened. Industry has suggested that the baseline standard could be that the inventory would be current within the year that it is to be handed off to the licensee. All update backlog would be completed.
- Negotiate with industry and MSRM to access the base map (TRIM) files.

Policy Needs

Option 3 is independent of new legislation or regulation changes such as RESULTS, DFAM, area-based tenure, etc. However, if there is a requirement for a VRI data base for provincial, national or international reporting, there would need to be policy developed for licensees to provide the data back to government to a specified standard.

Training

MSRM staff would need to be trained for an audit and monitoring capability.

Table 4: Update Process Flow for Option 3

	Source Information	Reporting	Validation / Audit	Update (Depletion / FTG / Natural Stands)	Distribution
Model	< "Industry Stewardship Process" > Government develops standards in collaboration with industry Industry develops toolsets to deliver standards			< Audit > (SRM Update Group)	< LRDW > (SRM)
Resourcing	0 FTE's			13 + FTEs	
Opportunities	▪ Possible 'partnerships' with industry to capture natural stand attributes. ▪ The forest industry is free to develop, purchase, or use their existing tools for capturing the changes to the VRI that meet their particular business needs			SRM moves to a focused audit role.	If access is free this would address industries access concerns.
Cons	▪ Unless required by legislation or by contractual obligation, licensees will not capture any additional information outside of their obligations ▪ Licensees opposed to additional costs.			"Stitching" process to piece together all licensee information required.	
Risks	▪ Ability to develop an acceptable standard that meets all client needs. ▪ Standards with a limited ability to enforce (without enabling legislation/contractual arrangement). ▪ Industry would require unrestricted access to TRIM base.			Licensee data may not be delivered in consistent format or timely manner	
Cost Estimate	There is no overall reduction in cost for this option for either government or the private sector. Audit and naturals $360,000 (6 FTEs) Cut in tool for industry $250,000 "Stitching" tool for government $100,000 + $360,000 (6 FTE)				$60,000 (1 FTE)
Total Cost	780,000 annual + $100,000 one time cost				

4.4 Option 4: No Update

Option 4 would be characterised as having no Update being completed by MSRM.

Option 4 pros, cons, risks, policy needs and training requirements are listed below. See Table 5 for a summary of this information along with information on resourcing and costs.

Pros

- There would be no direct short-term financial cost to government.
- There would be no direct short-term financial cost to industry.
- There would be an immediate cost-savings to government.

Cons

- Option 4 fails to meet current and anticipated regulated requirements.
- It does not meet client requirements for strategic or operational needs.
- Clients would likely develop their own planning-level forest cover inventory.
- Without update, there will be irreversible degradation of forest cover information which will lead to the need for a re-inventory once statistical validity of the inventory is lost.

Risks

The risks for Option 4 are as follows:

- Impacts to national and international commitments on sustainability, certification, and access to markets.
- Increasing uncertainty in AAC determinations, treaty negotiations and other statutory determinations.
- Reduced government credibility in managing natural resources.
- Increased inability to respond to NGO's assertions or information.

Policy Needs

MSRM would need to remove VRI update link to all legislation.

Training

There are no immediate training requirements

Table 5: Update Process Flow for Option 4

	Source Information	Reporting	Validation / Audit	Update (Depletion / FTG / Natural Stands)	Distribution
Model	Do no update to existing inventory.				Not required.
Resourcing	Industry implements its own minimal standards to meet business requirements.				
Opportunities	Short term cost savings (~ $2M/year)				
Cons	▪ No provincial picture of current inventory available. ▪ Lack of ability to monitor & report would likely foster international scepticism. ▪ Increased uncertainty in statutory decisions. ▪ As inventory looses currency (greater than 5 years) the need for a provincial re-inventory program will emerge (approximately $15–20 M/year). ▪ We will lose staff with specialized, experienced skill sets from government.				
Risks	Increased risk of poor resource management decisions being made. This includes the increased risk of litigation as a result of poor decision-making.				
Cost Estimate	Replace inventory with new within 10 years –$210,000,000				
Total Cost	Replacement cost when inventory becomes out of date.				

5. LOCATION AND ORGANIZATION OF MSRM RESOURCES

The location and organization of MSRM human resources, ranging from status quo to multiple service centres to one location[1] is based on the following assumptions:

- RESULTS will be used to feed the VRI change file.
- MSRM transition role is to do the natural disturbances, and the portion of the backlog not picked up via RESULTS; with a long-term objective to move into a monitoring and auditing role.
- The INCOSADA suite of tools will be replaced when an appropriate Update suite of tools is developed;
- MoF field services, B.C. Timber Sales and many government and external clients have said that proximity to the data and expertise is important to them. It is uncertain whether this translates to support for a dispersed model. What does come across is that access to current data is important.
- Staff continue to report to TIB.

Four models are examined below: dispersed, two service centre, one service centre and private sector..

5.1 Dispersed Model

This option assumes that vegetation update staff will work in a dispersed organization in either a forest district office or in an MSRM regional office. MSRM has shown that the updating of the vegetation changes can work in a dispersed (forest district oriented) model.

Pros

- Except for staff located in forest district offices that are closing as of March 31, 2003, staff would not have to move to a new location.
- Government and external clients have more points of entry to access staff expertise than in either of the service centre models.
- If access to staff expertise is critical, then this model may be the better model.
- If access to data is the critical element, then this model is no better than either of the service centre models.

Cons

The cons for this model are:

- A recent survey of the districts (Appendix --) indicated that:

[1] Does not include an examination of industry costs as it is outside the terms of reference.

  - despite having standards for attribute data collection in place for several years, the standards were not consistently applied between districts,
  - the time at which data was collected (milestones) was not consistent across the districts,
  - despite having dedicated staff for the update of the vegetation cover the update failed to meet the two year currency policy, and
  - the dispersed model does not lend itself to creating a critical mass of talent and expertise.
- In the long term it is uncertain whether the dispersed model is sustainable. Although there will be a core of experienced and talented staff at MSRM, experience has shown that remote supervision and management of the projects is difficult at the best of times.
- There would be no direct day-to-day supervision of the staff
- MSRM would have to maintain the infrastructure (and costs) across many locations
- Not all dispersed locations have access to high-speed large bandwidth lines for transmission of large volumes of spatial and attribute data.
- Not all MSRM regional systems' infrastructure support INCOSADA (a currently available update tool).

Although there is some risk that the current locations may not be the best for the client, the dispersed model provides the widest distribution of staff for one-on-one, face-to-face discussions.

Costs

- The government would not incur relocation costs for staff under this model as compared to other models, ‚assuming current locations are the correct ones„; however, there is a potential for increased travel costs for team meetings, to allow the update team to develop group synergies and to assist in overall team management.
- System infrastructure and support costs will be higher in the dispersed model as opposed to other models.
- There is a potential cost associated with workload duplication as a result of team members working on information from the same area.
- Overall management and day-to-day supervision of the project will take more effort than either of the service centre models. This is due in part to the challenges related to regular communication.

Policy

Interpretation and implementation of policy issues will likely be less consistent than in either of the service centre models. For the policy environment to work well in this dispersed model, good communication, strong supervision and management oversight is necessary.

Training

Unless there is a lot of computer-based training, the training costs will likely be higher in this model than in either of the service centre models because of increased travel costs.

Staffing

This option would likely require higher staffing levels to maintain production and level of service.

5.2 Two Service Centre Model

This option originally assumed that vegetation update staff will work in three service centres: Prince George, Kamloops and Victoria. In consideration of staff numbers, critical mass, locations of remaining staff and staff desires to move, this became a two service centre option with Kamloops and Prince George as the locations. Indication from staff and previous relocations indicate a reluctance to move to Victoria. Living costs were cited as the predominant factor. Nanaimo was considered as a potential service centre, however with a large area under TFL tenure, a more central location was preferable.

This would work with other locations assuming there was sufficient critical mass.

Pros

- The model maintains some semblance of proximity to the clients throughout the province.
- There will be a critical mass in each service centre to help promote synergies.
- There is the opportunity for staff to learn from one another at the service centre.
- Update staff would have access to high-speed, large bandwidth lines for transmission of both spatial and attribute data.

Cons

- Client access to the staff and expertise is limited to the service centre, phone, Internet or e-mail.
- Overall management of the project would require some enhanced level of communication but likely less effort than the dispersed model.
- It would provide for less opportunity than the dispersed model for one-on-one, face-to-face contact with the clients.
- Reluctance among staff members to move to Victoria because of the increased cost of living as compared to other provincial locations.
- Remote supervision would continue to be a reality but would take less effort than the dispersed model.

Costs

- The government could incur relocation costs to move staff to the service centres (Prince George and Kamloops) and could potentially incur increased travel costs for team meetings as with the dispersed model.
- System infrastructure and support costs would be lower than the dispersed model simply by virtue of the reduced number of locations. In addition RRID would likely be able to share these costs with other divisions within the service centres.
- There is a potential cost associated with workload duplication, although this will be less likely because of proximity of team members to one another.
- Depending on the transition plan, these costs could be reduced or minimized over time.
- Overall management costs of the two service centre model will be less than in the dispersed model but will likely be higher than in the one service centre model.
- Day-to-day supervision of staff in this model is likely to be less onerous than in the dispersed model but likely more than in the one service centre model.
- Managing and tracking priorities across three service centres will be less costly than in the dispersed model but probably more costly than a single service centre.
- This model will allow for better continuity than the dispersed model in the production environment due to more flexibility in vacation scheduling.

Policy

There will likely be fewer problems in interpretation and implementation of policy issues in this model than with the dispersed model simply because there are fewer sites to deal with in a service centre model.

Training

Training costs should be less in this model than in the dispersed model because we can reduce travel costs by bringing the training to fewer sites.

Staffing

As staffing levels drop, this model would become more sustainable than the dispersed model.

5.3 One Service Centre Model

This option assumes that all vegetation update staff will work in one service centre.

Pros

The pros for this model include:

- economies of scale;
- critical mass of expertise;
- easier to manage and supervise staff;

- staff can support one another;
- vacation scheduling is less of an issue than in either of the other two models;
- less overhead for project management;
- only one point of entry for government and external clients;
- there is likely to be more consistency with the workload with this model than the dispersed or two service centre models;
- with team members in one location the opportunity of workload duplication is greatly reduced; and,
- costs for maintaining the systems architecture and infrastructure will be lower than either the dispersed or two service centre models.

Cons

The con for this model is that there is only one point of entry to staff and expertise for government and external clients.

Costs

MSRM would incur initial high costs to move staff to one location.

Policy

There will likely be fewer problems and more consistency with interpretation and implementation of policy issues in this model than with either the dispersed or two service centre models simply because the staff will be in one site.

Training

Training costs should be less in this model than in the dispersed and three service centre models because we can reduce travel costs by bringing the training to one site versus many sites.

Staffing

This option could maintain the Update if staff did the natural depletions as well as the quality assurance. Reducing staffing levels would be sustainable if the workload was amended to focus on monitoring and quality assurance.

5.4 Private Sector Model

This option assumes that all vegetation update be done by the private sector.

Pros

The pro for this model is that it can take advantage of the contracting community's expertise and proximity to clients to address natural disturbance and backlog update issues, thereby reducing the number of FTEs required by the division.

Cons

- Critical mass of expertise will be lost by displacing the bulk of the update team; fewer FTEs would be required to handle contract administration and QA.
- There are not many companies in the private sector that are ready to step into this business. There would be an initial reduction in the production of updated files as the private sector geared up to do the Update.
- Relying on the contracting community may expose the government to quality and reliability issues.

Costs

The costs of this model would be the cost of contracting out the workload. At this time this cost of contracting this out are unknown.

Policy

Additional policy issues would arise around contracting, but otherwise the policy issues would be no different than in the one service centre model.

Training

Training costs would necessarily have to include more emphasis on contract management and quality assurance aspects than in any of the other models.

Staffing

It is unclear whether this option saves any FTEs over the one service centre option.

6. DIGIATAL DATA INTEGRATION

Embedded within Update Delivery Option 2, (Chapter 4) in which there is an industry/MSRM Update partnership using RESULTS, MSRM would have to budget for the creation and maintenance of a linkage between RESULTS and the MSRM VRI file. This chapter discusses three options to explore different data flow scenarios.

Refer to Figure 1, Data Flow Reference Diagram, which illustrates data flow. The area of interest for this discussion is located in Boxes 5 and 6. The complete data flow process is described in Appendix J..

Box 5 "Change" Linework + Inventory Attribution + Other Attribution

This box represents the required process to strip the required inventory data from the submitted silviculture data, derive what is possible to derive, and insert it into the inventory data model. The mapping of silviculture to inventory and required derivations is currently unknown. It is also recognized that the data submitted by silviculture is not the same as that required by vegetation inventory. There will be some "other" attribution required. The extent of that other attribution and how it will be collected and entered is currently unknown.

Box 6 Integration Process

Regularly (for example, once per year), the depletion (change) layer will need to be "cut into" or integrated into the existing approved vegetation inventory data and the previous vegetation inventory data archived. There are three options for integrating data outlined in table B below:

Table B: Options for the Digital Data Integration

	Tool Development	Integration	Free growing and natural Disturbances
Option A: Contract out the Process	Private Sector	Private Sector	Private Sector
Option B: MSRM Develop Tools and Implement	MSRM	MSRM	MSRM
Option C: MSRM Develop Tools and Private Sector to Implement	MSRM	Private Sector	Private Sector

There are many business issues that need to be addressed for the integration process, such as how small "left over" polygons are handled, how to assign attributes to a polygon that is cut

in half and re-attributed, and more. A discussion of the issues was well handled in the SIR pilot documentation.

The remainder of this chapter discusses three options for data flow.

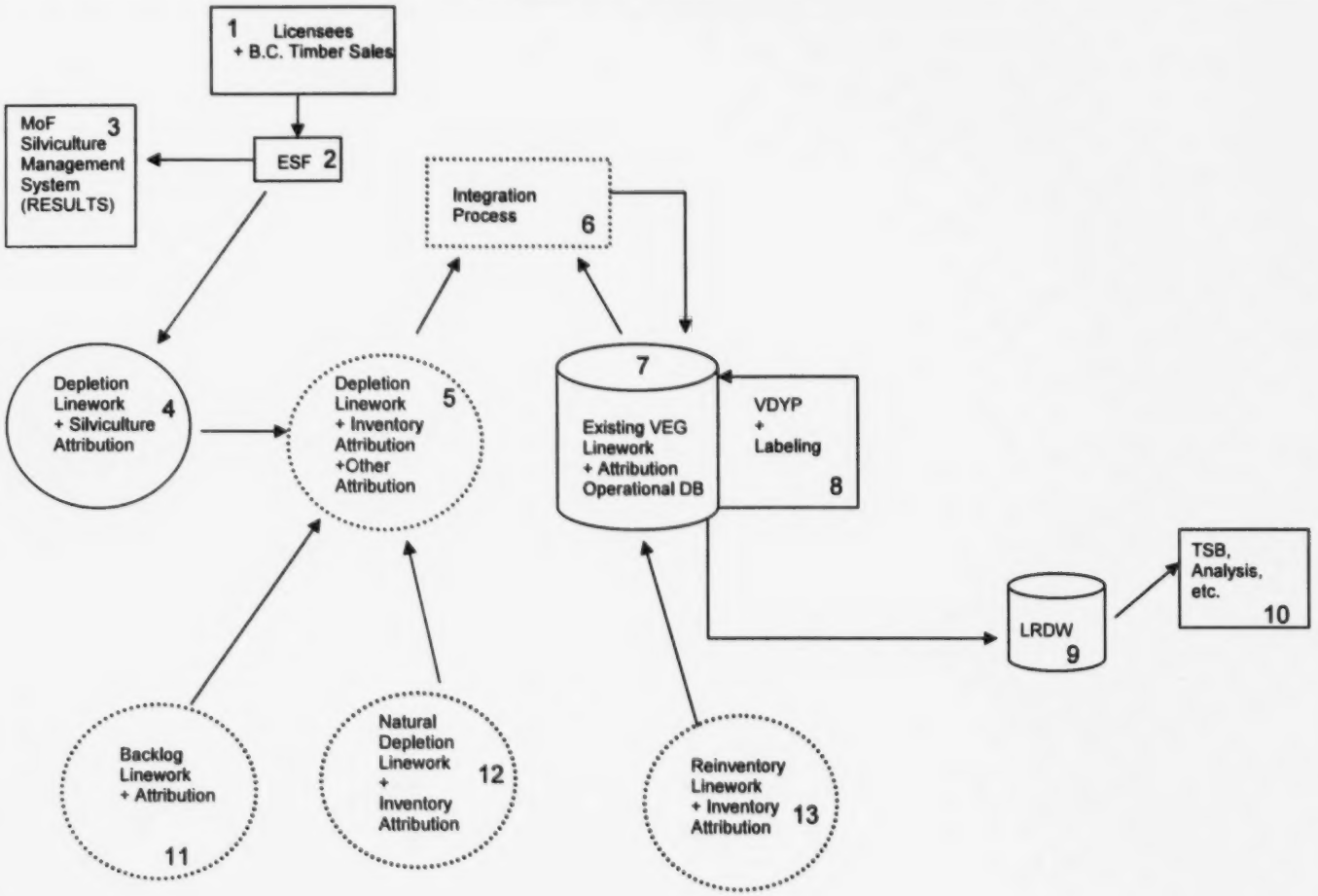

1 Licensees + B.C. Timber Sales
MoF Silviculture Management System (RESULTS) 3
ESF 2
Integration Process 6
Depletion Linework + Silviculture Attribution 4
Depletion Linework + Inventory Attribution +Other Attribution 5
7
Existing VEG Linework + Attribution Operational DB
VDYP + Labeling 8
TSB, Analysis, etc. 10
LRDW 9
Backlog Linework + Attribution 11
Natural Depletion Linework + Inventory Attribution 12
Reinventory Linework + Inventory Attribution 13

Figure 1: Data flow reference diagram

Discussion of the process flow is found in Appendix J

6.1 Option A - Contract out the integration

Once per year, or some other agreed upon time period, the depletion linework and associated inventory attribution (Box 5 in Figure 1) and the entire operational vegetation resources inventory would be made available to a contractor[2].

The private sector would then "cut" the depletions into the vegetation resources inventory (Box 6 in Figure 1) according to a set of business rules on how to handle resulting slivers, etc. In this option, the private sector would be responsible for developing the tools required for this process. MSRM personnel (branch and region) would ensure the depletions have been submitted, manage the contract, resolve problems encountered by the contractor, and check the work once it has been completed.

Pros

The pros for Option A are that:

- it is a relatively simple process; and
- software creation, as well as future software operating costs, would be confined to extraction, replacement of the layer and checking quality of deliverables.

Cons

Unknown. An expression of interest or request for information should be let to quantify the costs.

Risks

- There could be concerns of the quality of deliverable, which could lead to more time and money spent on quality assurance (QA).
- If at any time the cost to do this for a year is deemed too great, then the inventory will not be updated and the file will fall out of date.
- The skill set of personnel required to support this option may be different than that available to us.
- Time and resources will be needed to re-integrate the updated inventory into the LRDW. In updating the whole province in one process, this risk is minimized as this new layer would become the current layer and the previous layer archived.

6.2 Option B - MSRM Develop Tool and Implement

In Option B, MSRM builds a tool for "cutting in" the RESULTS data and runs this tool with in-house staff. This is, in effect, the SIR Pilot/Project and has been documented (*SIR Forest Inventory Update Procedure* - Version 5, Porcheron, Sapinsky, *et al.*). This relies on a tool

[2] This Process even has options: the contractor working by connecting to an edit layer within government infra-structure or the data unloaded and delivered to an off-site facility.

being developed by government contract to integrate the data as much as possible automatically (the pilot estimate was 80 percent) and then developing a toolset to help the user (MSMR staff) manually fix the remainder.

Pros

The pros of this option are:

- more direct control over data quality;
- possibly quicker turn-around time of updated inventory by eliminating the contracting process; and
- direct control by the data custodian on capture so there is ongoing QA instead of all at the end with as with Option A.

Cons

GENUS did extensive research into requirements for this tool and proposed a cost of $220,000. GENUS offered a partnership arrangement where the cost to government would be $70,000. Future maintenance costs were not discussed but the generally accepted ratio is 15 to 20 percent of development costs or $33,000 to $44,000 per year.

This option was also the subject of a resource requirement review led by Ruth Edwards. At the time it was estimated that this option would require "18 to 20 Resource Management Division (RRID) personnel." This includes both GIS operators and forestry professionals. It may be beneficial to confirm this estimate. The real resource impact is to do the manual work when the automated tool cannot decide what to do. The more manual work that can be automated, the less expensive the process will become.

Risks

- The staffing level required to support this option is greater than that available, so success at current staffing levels seems remote.
- The automated integration to manual intervention ratio is only an estimate. If this ratio is incorrect (i.e., there is more manual intervention required) then the problem outlined above is increased.
- The skill set required to run this tool may be different than that currently available.

6.3 Option C – MSRM Develops the Tool, Private Sector Implementation

In Option C, MSRM builds a tool for "cutting in" the RESULTS data and distributes it freely to the contracting community. The integration process (Box 6 in Figure 1) is done by contract.

This is like Option A in that the "cutting in" of the RESULTS data is done by contract. This case is different in that MSRM is offering a product that we have developed as an option to the contracting community to do the cutting in.

Pros

This may mean that more contractors will have the opportunity to bid on the contracted work.

Cons

The tool cost would be the same as Option B ($220, 000). The generally accepted maintenance ratio is 15 to 20 percent of development costs or $33,000 to $44,000 per year.

Risks

- There may be concerns over the quality of the deliverable;
- If at any time the cost to do this for a year is deemed too great then the inventory will not be updated and the file will fall out of date.
- The skill set of personnel required to support this option may be different than that available to us.
- There is a much larger risk in integrating this into one data set for the province at any one time (each contractor would be marching to a different drummer).
- Extra resources may be needed in stitching together many different datasets, which could be TSA based, forest district based or even landscape unit based.

Note: the last two points could be minimized by contracting to a single company for the update as in Option A above.

7. IMPLEMENTATION RECOMMENDATIONS

7.1 Short-Term (Transition)

Recommendation 1: *During fiscal 2003/04 proceed with Option 1 with a priority of meeting the Timber Supply Review Schedule (refer to Appendix I).*

In the transition to Option 2 we recommend implementation of Option 1 noting that it would be focused primarily on meeting Timber Supply Review data needs. It was recognized that industry would prefer more focus on the operational business drivers for Update and as such, requested that MSRM address their needs in the short-term if time permits.

In recommending Option 1 as the transition, the Task Team notes that this option is not sustainable. The focus for Update will be harvested stands, backlog free growing and natural stand catastrophic events with little to no update on other natural openings and other non-harvesting man-made disturbances.

7.2 Medium to Long Term Option

The four update options developed by the Task Team were compared to the Task Team Terms of Reference (TOR) for completeness and compliance to the outlined direction. Option 2 is the only scenario that satisfies the assumptions, as laid out in the Terms of Reference, in a sustainable process. Option 2 provides the least risk and does not negate moving to another option in the future.

Industry has indicated a willingness to implement this option as long as it does not create additional costs as a result of the Update process.

Option 1 does not meet the TOR or business needs and is not sustainable. Option 3 does not meet the TOR or business needs and provides an unacceptable degree of risk. Option 3 has increased costs to industry and does not decrease costs to government. Option 4 has too many risks associated with it and does not provide an acceptable solution for industry or government and will undermine the credibility of the province.

Recommendation 2: *The Update Task Team recommends Option 2 as the desired option for the long-term model as it meets the TOR requirements and will address industry concerns for preparing and submitting the data only once.*

Option 2 is dependent on RESULTS being implemented in a timely manner as identified by the MoF. This includes RESULTS becoming operational by July 31, 2003 and becoming fully functional by April 2004. If RESULTS is not successfully implemented, MSRM will be forced to go to the licensees and request the same spatial and attribute information for

Update. This may require legislation to require the information be provided. It is in MSRM's best interest to ensure that RESULTS succeeds.

As MSRM and industry migrate towards Option 2 and RESULTS becomes populated, the backlog free growing will be addressed.

Industry Concerns with Option 2

While the industry representatives at the table were in general agreement with Recommendation #2 of the task team, they voiced concern about the assumption that the maintenance of the VRI would rely on the implementation of RESULTS. Industry did not endorse this assumption.

Much of industries concern is with the unknowns and uncertainties with the implementation of RESULTS are around technical issues, standards and costs associated with data capture for populating RESULTS.

The details can be found in the letter addressed to the Chair in Appendix L..

7.3 Staffing Model

For this recommendation, industry members of the Task Team were not concerned with the model chosen. Their concerns were cost and access to data. As such, this recommendation is as a result of discussion by government members at the table.

For each of the staffing models reviewed, existing critical mass, access of clients to expertise, access to infrastructure, cost and maintenance of infrastructure and implementation issues were considered. In addition, staff was canvassed for input on model options and transition strategies.

With the staff remaining after April 2003, there is existing critical mass building in the Kamloops service centre. Feedback from staff has also indicated willingness for some to relocate to Kamloops. Prince George offers a second central location for the northern interior. However, this location has not been discussed with affected staff. These locations could also be supported by the remaining Victoria staff on a project basis.

Regardless of the number of service centres, costs to move staff to central locations are similar. As you move from a dispersed model to a single service centre model, the costs for maintenance of infrastructure and implementation are reduced.

Recommendation 3: *The two service centre model is recommended for implementation.*

The two service centre model creates a balance between client access, developing critical mass, ease of supervision, implementation of standards and policy, etc. If pressures to reduce staff continue, then the fall back would be one service centre for Update (Kamloops).

A transition plan will be developed by MSRM management and staff at the request of the Executive.

7.4 Digital Data Integration

Within Recommendation 1, MSRM has several options regarding how they manage the incorporation of data from RESULTS to the VRI file. This work should not affect industry in so far as it does not add costs to the update data collection process. Industry's concern, however, is timely integration and availability of data.

Three options were discussed to complete this process. Option A focussed on having the private sector integrate the update layer to a specific set of standards to the VRI file. Option B requires MSRM to develop software and implement the integration of the update layer --to a specific set of standards -- to the VRI file. Option C requires MSRM to develop software and to contract out the implementation of the integration.

In all three options, MSRM would be responsible for cost of integration, quality control and audit of the information.

No consensus was reached for this process. However, the option that provides the most cost effective solution with the least risk to government should be adopted.

Recommendation 4: *There was no consensus on this issue. We recommend having this resolved by a small focussed team and to report within two weeks of the report being submitted.*

The team should consist of a VRI specialist, update specialist, database specialist and a systems specialist and led by the Task Team Chair.

7.5 Implementation Milestones – Next Steps

The implementation of the desired update model has been considered within the context of Update Task Team's Terms of Reference. Implementation milestones have been developed and presented in Table 6.

Table 6: Update Implementation Milestones

Milestone	Responsible	Timeline
Default to Option 1	MSRM	2003/04
Report Submitted to Directors (decision pending)	MSRM	Mar 26, 2003
Update Staffing Transition Plan complete	MSRM	June 1, 2003
Project plan developed for backlog and natural disturbances	MSRM	June 1, 2003

Rules developed for integration of RESULTS data onto vegetation inventory	MSRM	June 15, 2003
RESULTS operational	MoF	Aug 1, 2003
Monitoring and Auditing process developed for the vegetation update process	MSRM	Dec 2003
Update for Backlog completed	MSRM	tba
Update for Natural disturbance completed	MSRM	tba
RESULTS is fully functional and sustainable with a Harvest Depletion and FTG focus	MoF	April 1, 2004
Integration procedure developed, tested and operational	MSRM	Sept 2003 to June 2004

APPENDIX A: DETAILED SUMMARY TABLES FOR VRI UPDATE OPTIONS

	Source Information	Reporting	Validation / Audit	Update (Depletion/ FTG/Natural Stands)	Distribution
Option 1	**"Government Stewardship Pre RESULTS"** 12 technical staff plus 1 manager				
	Licensees: Provide information in an adhoc manner.	Spatial: Adhoc Attribute: ISIS/ Results when available	Adhoc by District or Region	INCOSADA	IODM replicated in Regional Servers Cumbersome
Resourcing	0 FTE's (Resourcing reduction in 03/04 downsizing)			13 FTEs	
Cost	$360,000		$150,000	$210,000	$60,000
Total Annual Cost	$780,000				

Note: Costs do not include capital cost, discretionary costs or infrastructure costs.

	Source Information	Reporting	Validation / Audit	Update (Depletion/ FTG/Natural Stands)	Distribution
Option 2	**"Government Stewardship With RESULTS"**			SDE Tool (SRM)	LRDW (SRM)
Resourcing	0 FTE's			13 FTEs	
Cost Estimate	There is an overall reduction in government resourcing if RESULTS (with spatial) is implemented. Development of business tools $250,000 Audit and Naturals $720,000 (12 FTE) Industry cost to supply digital spatial and attribute Information:				$60,000 (1 FTE)

	Unknown	
Total Annual Cost	$780,000 annual + $250,000 one time cost	

Option 3	**"Industry Stewardship Process"** Government develops standards in collaboration with industry Industry develops toolsets to deliver standards	Audit (SRM Update Group)	LRDW (SRM)
Resourcing	0 FTE's	13 + FTEs	
Cost Estimate	There is no overall reduction in cost for this option for either government or the private sector. Audit and naturals $360,000 (6 FTEs) Cut in tool for industry $250,000 "Stitching" tool for government $360,000 (6 FTEs) + $100,000 (for building stitching tool)		$60,000 (1 FTE)
Total Annual Cost	780,000 annual + $100,000 one time cost		

Note: Costs do not include capital cost, discretionary costs or infrastructure costs..

	Source Information	**Reporting**	**Validation / Audit**	**Update** (Depletion/ FTG/Natural Stands)	**Distribution**
Option 4	**"No Update"**				
Resourcing	Save $ 2m/year, but after 5 years re-inventory costs are unavoidable.				
Cost Estimate	Replace inventory with new within 10 years –$210,000,000				$60,000 (1 FTE)
Total Annual Cost	$60,000 + Replacement cost when inventory becomes out of date.				

Note: Costs do not include capital cost, discretionary costs or infrastructure costs.

APPENDIX B: TASK TEAM MEMBERSHIP

Name	Organization	Location
Rick Baker (chair)	MSRM, Terrestrial Information Branch (TIB)	Kamloops
Bill Wade	Canadian Forest Products Ltd.	Prince George
Dan Battistella	Weyerhaeuser Canada	Kamloops
Dave Byng	Western Forest Products	Vancouver
Eric Fisher (secretary)	MSRM, TIB	Victoria
Chris Fletcher	MoF, TSB	Victoria
Marc Rousseau	MSRM, TIB	Ft St John
Tim Salkeld	MSRM, TIB	Victoria
John Wakelin	MSRM, TIB	Victoria
Doug Say	MSRM, IMB	Victoria
Brian Howden	MoF, IMG	Victoria
Ross Porcheron	MSRM	Kamloops
Gene MacInnes	MoF	Chilliwack
Dennis Singer	BC Timber Sales	Burns Lake
Don Gosnell (sponsor)	MSRM, TIB	Victoria

APPENDIX C: TERMS OF REFERENCE

Vegetation Update Task Team

Terms of Reference

Vision:

To provide information users with forest cover information which is supported by a sustainable business model.

Scope:

Updating of selected spatial and descriptive attributes within the provincial vegetation coverage which change due to natural and human activities and are defined by business drivers.

Objectives:

To provide recommendations for satisfying the business drivers via vegetation cover update in the short, medium and long term which reflect both risk to users and cost of delivery.

The Challenge:

To recommend a framework that facilitates the utilisation of information describing changes to the vegetative cover (including information via Ministry of Forests 'RESULTS');

Update is defined as involving 'managing' these 3 'business' units (sub populations):

- "Natural" Stands - when things change (i.e., fire, disease, insects, and succession).
- "Managed" (post free growing) Stands - Free growing (FG).
- "Harvested" (harvested through to Free growing) Stands.

To maintain the integrity of the 'inventory' all 3 sub-populations need to be "managed" for the Inventory to remain current over time.

Assumptions:

- Industry collects most of the information required to meet update business needs (due to regulatory requirements);
- The model must not duplicate other reporting requirements;
- The model must provide timely access to the updated data;
- The model must not significantly alter the delivered data;
- Government will retain resources to meet TSR vegetation data needs on TSAs in 03/04;

- Until otherwise instructed, TFLs will continue to deal with update status quo;
- The Vegetation Cover Update data requirements for harvest activities can be managed under a single process (RESULTS). RESULTS will supply spatial and attribute information. The associated workload for the industry is unquantified at this time and needs to be articulated.
- Electronic data transfer is supported for RESULTS transactions. There will be a phase in and this will be in concert with the Timber Harvest and Silviculture Practices and Regulations.

The Update Task Team will:

- Develop a report including scenarios for the long term model (including a transition strategy) for vegetation cover update with the primary variables being:
  - The model for information delivery required to meet the business needs (including the functions of data collection, verification and audit).
  - What will be the respective roles of the licensee and government resources to meet known business needs?
  - What standards (input and validation) and subsequent policy need to be developed?
  - What risks/benefits are affected by scenarios that transfer more responsibility to the private sector?
  - What alternatives to the current model would allow for more private sector liability thereby freeing up government resources for other priorities?
  - The location and organization of government (MSRM) human resources (ranging from status quo to multiple service centres to one location);
- The report will address the pros/cons of each scenario and will offer a recommended course of action.
- The report will also identify transition strategies from status quo to each of the models including training, HR management and budgets.
- The date for submitting this report will be on or before March 31, 2003.
- The report will provide an opportunity for sign off by the team members.
- The report will be presented to the Director, Terrestrial Information Branch.

Roles and Responsibilities of the Task Team:

1. Project Manager
   a. manage the business of the team

b. lead in the development of a final task team report

c. manage the communications of the task team

d. provide support to the task team

2. Project Co-ordinator

   a. Provide support regarding identification and resolution of technical issues to the task team

   b. In co-operation with the project manager set task team priorities

   c. Co-ordinate input and feedback as required on technical issues to the task teams

   d. Assist the project manager with communications needs.

   e. Co-ordinate the logistics of the task team.

3. Task Team Members

   a. Participate on the task team to support the development of the report

   b. Participate as needed on sub-teams to review, analyse and report out on technical issues and process design

   c. Meet as a team once per month (December 2002, January 2003, February 2003 and March 2003)

   d. Participate in conference calls as required

   e. Share information with the team to help develop a future vision for the vegetation cover update process

   f. Identify and help resolve technical issues and concerns.

Submitted On behalf of the project team by:

_____

Rick Baker RPF
Project Manager

Approved by:

_____

Don Gosnell RPF
A/Director, Terrestrial Information Branch

Date: _____

APPENDIX D: CHANGE MANAGEMENT TILE

The Change Management Tile (CMT) is a spatial representation of all silvicultural openings and provides for tracking changes due to disturbances (i.e., harvesting, wildfire, pest infestations, etc.) separately from the vegetation inventory. The spatial product is intended to be linked to ISIS/MLSIS via the Silviculture Information Access (SIA). The resultant coverage is intended to be GIS-ready and can easily be used with existing inventories to obtain a variety of land base information and as input for more complex resource analysis and decision making.

The CMT:

- provides a clear separation between vegetation and silviculture information,
- ensures that the vegetation data set integrity is not compromised by ad-hoc changes,
- eliminates redundancy of information and effort between vegetation and silviculture inventories,
- makes use of the most current information for analysis and reporting,
- eliminates mapping scale differences and data discrepancies between corporate databases, and
- provides for immediate application with existing tools and technology and minimum training for staff.

A CMT containing spatial information relating to harvested areas (i.e., silviculture openings) is currently used for vegetation inventory update in the Prince George region and in parts of the Skeena region. Both regions currently use MicroStation/Maps3D tools compatible with INCOSADA, although the Skeena region has plans to create and maintain the CMT in a GIS environment. And although the CMT creation in the Prince George region was completed using the MicroStation/Maps3D tools, the regional plan is to maintain the CMT in a GIS environment. Translation routines between the INCOSADA/Microstation environment and a GIS environment have been developed and successfully implemented by the Prince George update staff. These include the linkages of database attributes between the CMT and SIA. These linkages are essential for data analysis.

Business processes related to the digital standards associated with the CMT still need to be clearly defined for a successful province-wide implementation. These include standards related to the creation of the CMT, and database linkages between the CMT and SIA. The methodology that could be used to update the vegetation inventory attributes to reflect changes monitored with the CMT also still needs to be fully investigated and resolved.

APPENDIX E: CHANGE DETECTION

The *change detection* portion of the Inventory Audit function can provide an efficient and cost effective aid for forest cover update. The change detection outputs are easy to use, work within both a microstation or ArcGIS environment and can provide TSA-wide coverage. It provides a disturbance shape, but does not provide any history or silviculture attributes. With decreasing human resources and capacity in data service centres, the change detection process can help streamline and reduce the workload of spatial forest cover updating.

In a nutshell, the *change detection process* begins with Landsat images from two dates, runs through a series of image analysis steps and ends with the creation of a spatial raster and vector file. The change image (raster) shows all harvesting between two selected dates, 2000 and 2003 for example, highlighted in red. This makes it very easy to see where harvesting has occurred between the two dates across an entire TSA. The change shape file (vector) being a spatial delineation of the harvested areas, can be copied directly into the forest cover files and the shapes easily modified if needed.

Landsat7 images are presently recommended due to their low cost and broad availability. Other imagery such as SPOT5 or IRS can be used, however they would only be recommended for small areas (not an entire TSA) if better resolution is warranted and the expense can be justified. Landsat images generally have sufficient resolution to meet the current inventory update standards. The majority of clearcuts are delineated very well during the process, but more work is needed to properly delineate partial cuts.

The change detection products can be produced for the Update Team on an as needed basis beginning immediately. The Lillooet TSA has just been completed and the Clearwater is underway. Two landscape units were produced for the Quesnel district as questions were raised about the currency of the inventory files. A change detection image was created and sent to the North Coast district to aid in locating missing cutblocks for update. Improvements are continually being made to better enhance the delineation as well as streamline the process. At the moment it is estimated that producing the change products for an entire TSA (not including purchasing of new imagery) would take approximately 2 weeks for an average sized TSA. If new imagery needs to be purchased the cost is approximately $1200 per image and the orthorectification process (completed under contract) takes an additional 2 weeks.

The change detection process is presently being lead by TIB and some of the software and experience is not readily available elsewhere, including the contracting community. For now, it is recommended that the change detection function remain in Victoria. The hardware, software and image analysis expertise needed is available in TIB and due to the cost and licensing restrictions of some of the software, it is logical for this function to remain centralized. The change files can easily be sent to the regional data service centres and used

directly by the update teams in their offices. Other alternatives or options could be explored during the transition.

Below is an example of the spatial change coverage from the Lillooet TSA. The delineated cutblocks are shown in white overlaid on the 15m panchromatic band.

APPENDIX F: DATA CURRENCY SURVEY RESULTS

	Region	Coast	Southern Interior	Kootenay	Cariboo	Skeena	Omineca Peace	Comments
	Reported as:	7 Districts	5 Districts	6 Districts	1 Region	1 Region	1 Region	
Update Milestones	Harvest depletion	7 / 7	5 / 5	6 / 6	1 / 1	1 / 1	1 / 1	
	Regen delay	6 / 7	0 / 5	6 / 6	1 / 1	0 / 1	0 / 1	Dropping all regen delay updates could double map production (estimates from SIR operations this past year)
	Free growing	7 / 7	5 / 5	5 / 6	1 / 1	1 / 1	1 / 1	Need to review actual FTG procedures--likely a lot of variation
	Natural stand disturbances	7 / 7	5 / 5	6 / 6	1 / 1	1 / 1	1 / 1	Dependent on source data from other agencies or imagery
	Wildfire depletion	7 / 7	5 / 5	6 / 6	1 / 1	1 / 1	1 / 1	Dependent on source data from MoF
	Other			1 / 6				Road & range work done (outside Veg update mandate)
Who updates	Inventory/LIM Officer		1 / 5	1 / 6				
	Update technician	1 / 7		2 / 6	1 / 1	1 / 1		
	Both	6 / 7	4 / 5	3 / 6			1 / 1	SIR–Tech's do depletions, Officers do FTG
Update frequency	Continuous	2 / 7	1 / 5	2 / 6	1 / 1	1 / 1	1 / 1	
	Annual		3 / 5	3 / 6				
	Bi-annual	1 / 7		1 / 6				
	Prior to TSR	4 / 7	1 / 5					
Where update occurs	Individual district	3 / 7	1 / 5	6 / 6				Kootenay Lake update only done at Regional office
	Shared districts	1 / 7	4 / 5			1 / 1	1 / 1	
	Centralized at region	3 / 7			1 / 1			

Region		Coast	Southern Interior	Kootenay	Cariboo	Skeena	Omineca Peace	Comments
Reported as:		7 Districts	5 Districts	6 Districts	1 Region	1 Region	1 Region	
Spatial source	Hardcopy	7 / 7	4 / 5	5 / 6	1 / 1			
	Digital	3 / 7	5 / 5	6 / 6	1 / 1	1 / 1	1 / 1	Variation between FDP, DEA & MoF Tenures sources for all
	Imagery	6 / 7	5 / 5	5 / 6	1 / 1	1 / 1	1 / 1	
	Other	1 / 7						SBFEP does 1:10,000 photos annually for SI District
Attribute source	Hardcopy	7 / 7	5 / 5	5 / 6	1 / 1		1 / 1	
	ISIS/SIA	7 / 7	5 / 5	6 / 6	1 / 1	1 / 1	1 / 1	
	Other (photo interpretation)	1 / 7	4 / 5	2 / 6				Diap viewer used in Arrow District
Update tools	INCOSADA	4 / 7	5 / 5	6 / 6	1 / 1	1 / 1		2 coast districts not fully converted to INCOSADA yet
	Change monitoring tile						1 / 1	Have INCOSADA files but use CMT & Arc Info translations
	Other (FCI/FIPS's)	1 / 7						Fraser TSA--updates in FC1/FIPS's not INCOSADA files
Update standards	Within 20 m	3 / 7	5 / 5	5 / 6		1 / 1	1 / 1	SIR--previous updates may be to 40 m standard
	Within 40 m	4 / 7		1 / 6	1 / 1			Cariboo defaults to lowest standard
	Other							
External boundaries	Total area under prescription		4 / 5	4 / 6			1 / 1	Variance in TAUP boundary definitions by MoF creates consistency problems for update--refer to SIR Procedures for examples
	Depleted area only	7 / 7	1 / 5	2 / 6	1 / 1	1 / 1		
	Other							

APPENDIX G: BUSINESS DRIVERS FOR UPDATE

Use	Users	Remarks about Accuracy and Currency	Currency
TSA timber supply analysis - Chief Forester	FS/DFAM/IFPA/woodlot with Chief Forester/RM/DM as the SDMs	Update information - forest cover with reasonable accuracy ± 10%, all resource information, administrative boundaries	1 year prior to TSR
Forest development plans	DM and Licensees	Must present current status of all NSR and free growing stands in the area of the plan	Current to the time of production of FDP
Forest stewardship plans	Licensees	Must present current status of all NSR and free growing stands in the area and site plans	Current to the time of production of FSP
Site plans	Licensees	Must present current status of all NSR and free growing stands in the area in the site plans	Current to the time of production of site plans
Forest health planning	MoF/DAMF/Licensees	No comments received.	
Sustainable forest management plans	Licensees (FIA)	Updated silvicultural activities are required for FIA purposes?	Annually
Range Use Plans	MoF/Permitees	No comments received.	
MSRM - resource planning - OGMA - defining variant targets and placement of OGMA	MSRM	Based information from last TSR. Updated information for defining targets. Forest cover with at least 1 to 2 year currency and all resource information, administrative boundaries needed for placement of OGMA	2 years - accuracy can be enhanced with aerial photography or field visitation
MSRM - resource planning - OGMA - determining wildlife tree retention targets	MSRM	Based information usually from last TSR. Updated information for defining targets	2 years
MWLAP - ungulate winter range planning	MWLAP	Based information usually from last TSR. Updated information for defining targets. Forest cover with at least 1 to 2 year currency and all resource information needed for placement of UWR	2 years - accuracy can be enhanced with aerial photography or field visitation
Treaty negotiations	TNO/MoF	Up-to-date maps (2 years) for evaluating offers - AAC impact and land and resource values	2 years - accuracy can be enhanced with aerial photography or field visitation

Use	Users	Remarks about Accuracy and Currency	Currency
Consultations - First Nations	MoF/Licensees	Must present the most accurate information to avoid misrepresentation (see FDP and FSP requirements)	Current to the time of consultation
Forest health management	MoF/Licensees	To keep up-to-date tracking of natural disturbance for insect and disease management	2 years
Forest fire management	MoF	To keep up-to-date tracking of fires	2 years
Watershed assessment CWAPS)	MWLAP/Licensees	Based information usually from last TSR. Forest cover with at least 1 to 2 year currency needed to determine clear-cut equivalent area and road lengths	2 years
Visual impact analysis	MoF/Licensees	Need current depletion for digital terrain modelling	Current to the time of production of DTM
Compliance monitoring	MoF/WLAP/NGO	Need current depletion for compliance and enforcement by MoF and WLAP under the RBC. NGOs will be requesting the information under FOI	Current to the time of inspection
Biodiversity monitoring	MSRM/MoF (?)	Monitoring the established objectives by BEC variants and zones	2 years
Silviculture activities monitoring/governance	MoF	Need current depletion for monitoring activities	Current to the time of monitoring
Charting/assignment of operating areas in TSAs	MoF	Allocation of operating areas to licensees	2 years
Certification	B.C. Timber Sales/Licensees	No comments received.	2 years
National and international reporting	B.C. Government	Biodiversity, sustainability.	2 years +
Habitat analysis	Gov't and Licensees	No comments received.	
TEM/PEM	MoF/DFAM/Licensees	No comments received.	
Impact analysis	Gov't	Analyzing the impact of options for special/one time only resource or land deletion initiatives - area and volume removed from the area of interest	Current to the time of analysis

APPENDIX H INVENTORY SPATIAL UPDATE AUDIT

The inventory spatial update audit is a process developed by TIB to periodically audit forest inventory for errors of omission, commission and misplacement of major disturbances such as harvesting, fire, and insect/disease damages in the provincial inventory. The process is effective, reliable, and efficient using low cost satellite remote sensing data and state-of-art image analysis and GIS techniques. It will provide important information about the spatial quality of the inventory. This information is also useful for inventory update planning, and for Timber Supply Review if there is no other information available.

The process will address MSRM's goal 2: Effective delivery of integrated, science-based land, resource and geographic information" (particularly objective 1: *accurate, relevant, and cost effective and timely land and resource data and information).*

The audit process consists of two main components:

1. Image and GIS processing and analysis - including image/data acquisition, geometric corrections, enhancement, and classification, as well GIS data preparation and processing, and
2. Auditing - including auditing (manual process assisted by semi-automatic techniques) of the inventory information using the image/GIS analysis results, and reporting

Several image and GIS processing and analysis tools have been developed over the last few years that can be incorporated into the inventory audit process. Satellite imagery is used as it is very cost effective in covering large areas. However, other higher resolution images can be incorporated if needed to meet audit goals. It is important that the image analysis and the audit remain closely linked to take advantage of the synergies and skills of the various people involved. Both processes are dynamic and require input from each other.

In addition to the auditing purpose, the audit process could be used to aid with the identification and mapping of backlog and natural disturbance areas as well as for areas where no stakeholder information is available. As the audit process evolves, more of these problem areas can be identified and solutions provided. The key is for open communication and exchange of ideas amongst the audit team as well as from key stakeholders.

A standard audit report can be produced for a TSA or DFAM area. The report can contain statistics for the area harvested, number of polygons misplaced or missing, volume of species harvested etc for the specified audit timeframe.

Recommendations on Implementation

1. An audit plan be developed for the province for 2003-2008. This plan should clearly identify audit objectives, anticipated funding needs, schedule, and other critical issues. This plan should incorporate the TSR schedule, licensee requirements and any other issues identified by the Update Task Team.

2. An Audit Team be identified, according to the plan, consisting of MSRM regional and headquarters participants. It is important to have the regional local knowledge as well as the core knowledge from headquarters. Regional team members can help strengthen industry partnership and data exchange at the local level as well as provide local knowledge in comparing the existing inventory to the audit results.

3. All image acquisition, processing and analysis be done centrally. These tasks require specialized skills and software/hardware tools which are presently only available at TIB. It is also recommended that image acquisition be coordinated and purchased centrally for maximum effectiveness. All imagery acquired can be made available through DIM to all partners and agencies.

Below (Figure F1) is an example of omission errors automatically identified and mapped by the audit process (existing forest inventory cover map lines in dotted black, and lines from audit process in white).

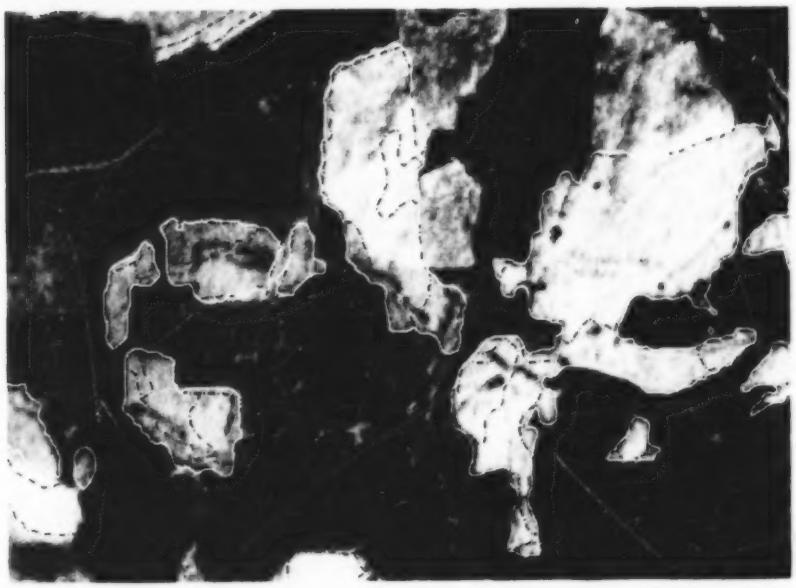
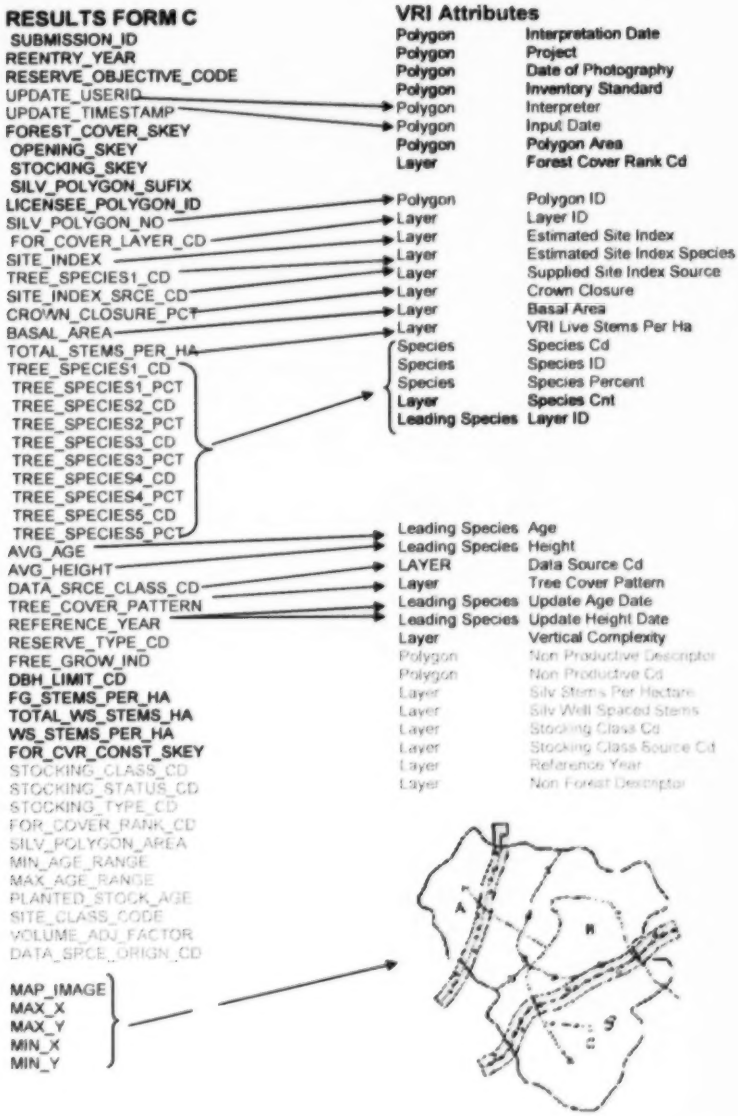


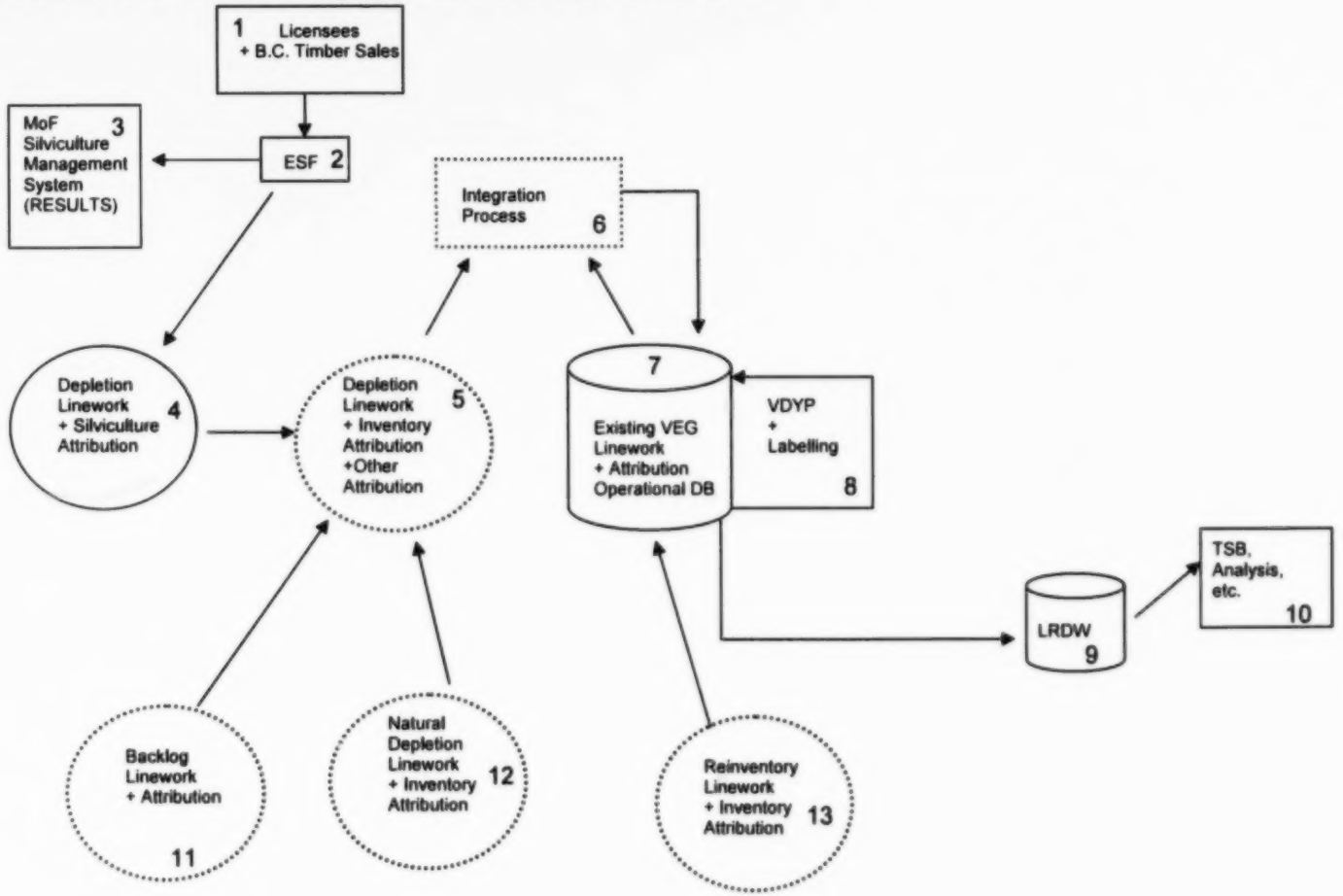
Figure F1: Example of omission errors for automatic classification of Landsat Imagery

APPENDIX I: INFORMATION MAP FROM RESULTS TO UPSATE



Blue= shared data Black= Program Specific Data

APPENDIX J: ELECTRONIC TRANSFER OF DATA


1 Licensees + B.C. Timber Sales
MoF Silviculture Management System (RESULTS) 3
ESF 2
Integration Process 6
Depletion Linework + Silviculture Attribution 4
Depletion Linework + Inventory Attribution +Other Attribution 5
7
Existing VEG Linework + Attribution Operational DB
VDYP + Labelling 8
TSB, Analysis, etc. 10
LRDW 9
Backlog Linework + Attribution 11
Natural Depletion Linework + Inventory Attribution 12
Reinventory Linework + Inventory Attribution 13

Box 1 Licensees and B.C. Timber Sales

This box represents data capture by forest tenure holders including B.C. Timber Sales. The method of capture is irrelevant and is considered the external user's business and not of interest to the Province. What is of concern is that the output of this capture is linework and attributes consistent with regulations concerning submission of silviculture information. This will be XML/GML format. B.C. Timber Sales will be using GENUS for this function and GENUS will export to this format as a standard part of the product. Other tenure holders may choose a different tool for data capture.

Box 2 ESF

This box represents the Electronic Submission Framework system created under RESULTS that will recognize data as it is submitted, accepts it on behalf of the Ministry and then directs it to the appropriate business area. In this context the submission is expected to be a polygon and RESULTS (silviculture) attribution.

Box 3 MoF Silviculture Management System (RESULTS)

This box represents the Ministry of Forests Silviculture Management System rewrite (RESULTS).

Box 4 Depletion Linework and Silviculture Attribution

This box presents a single Spatial Database Engine (SDE) data layer containing the changes to the vegetation inventory (depletions and Free growing) polygon and associated silviculture attribution as submitted to the RESULTS system. As data is submitted to RESULTS it is also added to a layer that will be used to update the vegetation inventory. This layer will contain all "change" data submitted to RESULTS for the province.

Box 5 "Change" Linework + Inventory Attribution + Other Attribution

This box represents the required process to strip the required inventory data from the submitted silviculture data, derive what is possible to derive, and insert it into the inventory data model. The mapping of silviculture to inventory and required derivations is currently unknown. It is also recognized that the data submitted by silviculture is not that required by vegetation inventory. There will be some "other" attribution required. The extent of that other attribution and how it will be collected and entered is currently unknown.

Box 6 Integration Process

Regularly (e.g., once per year), the depletion layer will need to be "cut into" or integrated into the existing vegetation inventory data and the previous vegetation inventory data archived.

There are many business issues that need to be addressed for the integration process, such as how are small "left over" polygons handled (less than... say 1000 m^2 are automatically

eliminated, 1000-5000 m^2 are flagged, and elimination is an option, the rest stay and take on the existing typed attributes) is a polygon that is cut in half re-attributed (only if time allows—the standard would be to take on the existing typing) and more. A discussion of the issues was well handled in the SIR pilot documentation.

Box 7 Existing VEG Linework and Attribution Operational DB

This box represents the operational or production database in which the data is stored. It will be a spatial data engine layered on Oracle.

Box 8 VDYP and Labelling

This box represents the automated process in which all submitted data is projected to the current year and a label for representational purposes is calculated. This process also includes the once per task of re-projecting the entire database to the new year shortly after January 1.

Box 9 LRDW

The Land Resource Data Warehouse where data is published and analysis integration is done. It is read-only.

Box 10 TSB, etc.

This box represents access and distribution of data contained in the data warehouse. This is where data users will get data for analysis and reporting.

Box 11 Backlog Linework and Attribution

This box represents man-made depletions that have not been entered into the current corporate repository. This includes change management tiles, and submission on paper format.

Box 12 Natural Depletion Linework and Inventory Attribution

This box represents naturally occurring depletions. Licensees may or may not capture these and may or may not be willing or able to submit them. This may be something MSRM resources can handle. The relative volumes of man-made depletions compared to naturally occurring depletions are currently unknown.

Box 13 Reinventory Linework and Inventory Attribution.

Complete re-inventories will periodically be completed. These will be required to be integrated into the database.

APPENDIX K TSR UPDATE SCHEDULE

TSA	District Name	Update Least Current to	Update Most Current to	Current update status	TSR Data Package (data file should be ready here)	Update Priority	Update Comments
100 Mile House	100 Mile House		2001	active	Feb-05	Low	
Arrow	Arrow	2000	2001	active	Mar-03	Low	Done in March 2003
Arrowsmith	South Island		2000	inactive	Jun-05	Low	
Boundary	Boundary	2000	2001	inactive	Sep-04	Low	
Bulkley	Bulkley	2000	2000	inactive	Sep-04	Low	
Cassiar	Cassiar	2000	2000	inactive	Sep-04	Low	
Cranberry	Kispiox	1999	2000	inactive	Mar-02	Low (done)	
Cranbrook	Cranbrook	1999	2000	inactive	Dec-02	Low (done)	
Dawson Creek	Dawson Creek	1994	2001	inactive	Feb-06	Med	CMT updates complete/2001 source data used
Fort Nelson	Fort Nelson	1998	2001?	inactive	May-03	CMT ok for TSR? Med	Ready to go in March 2003
Fort St John	Fort St John	1998	2001?	active	Feb-06	Med	
Fraser	Chilliwack		1996 (VRI)	inactive	Jan-03	[illegible]	Need to extract FC1 depletions & update VRI file Good candidate for new CMT
Golden	Columbia	1996 (VRI)	1997 (VRI)	active	Apr-02	[illegible]	Commitment to licensees to complete this update
Invermere	Invermere	2000	2001	inactive	Jun-04	Low	
Kalum	Kalum	1999	2001	inactive	Dec-02	Low (done)	Update complete for TSR
Kamloops	Clearwater		2001	active	Sep-05	Low	Some carryover work from 2002 SIR updates--Andy to address
Kamloops	Kamloops		1997	active	Sep-05	[illegible]	Will be completed March 2003
Kingcome	Port McNeill	1996	1997	inactive	Sep-05	[illegible]	2002 imagery not available for update use
Kispiox	Kispiox	1999	2000	inactive	Feb-05	Low	
Kootenay Lake	Kootenay Lake	1999	2000	active	Sep-04	Low	
Lakes	Lakes	2000	2000	inactive	Sep-04	Low	
Lillooet	Lillooet		1998	active	Feb-04	[illegible]	Will start depletion update in Feb 03, Ann M to provide image analysis
MacKenzie	Mackenzie	2000	2002	inactive	Feb-04	Med	CMT updates complete/2002 source data used
Merritt	Merritt		2001	active	Nov-03	Low	Merritt will be completely updated to 2002 (FG & depletions)
Mid Coast	Mid-Coast		1995	active	Nov-03	[illegible]	no updates can be done until data conversion complete in Feb/Mar
Morice	Morice	1993	2001	active	Feb-06	Low	
Nass	Kalum	2000	2001	inactive	Jun-05	Low	

TSA	District Name	Update Least Current to	Update Most Current to	Current update status	TSR Data Package (data file should be ready here)	Update Priority	Update Comments
North Coast	North Coast	1995	1997	active	Oct-03	High	Not all source was provided by MOF--2002 imagery not available
Okanagan	Penticton		2001	inactive	May-04	Low	
Okanagan	Salmon Arm		2001	active	May-04	Low	FTG only
Okanagan	Vernon		2001	inactive	May-04	Low	
Prince George	Fort St James	2000	2001	active	Sep-05	Med	2000 and some 2001 source data used
Prince George	Prince George	1998	2001	inactive	Aug-05	Med	2001 source data used
Prince George	Vanderhoof	2001	2002 (VRI)	active	Sep-05	Med	2002 VRI and 2001 FDP source data used
Queen Charlotte	Queen Charlotte		1996	inactive		Low	Good candidate for new Update Tool pilot
Quesnel	Quesnel		2002	inactive	Feb-04	Low	
Revelstoke	Columbia		1999	inactive	Mar-02	Low (done)	TSR files already prepared
Robson Valley	Robson Valley	2001	2002	inactive	Feb-03	CMT is OK for TSR Low	Ready to go in March 2003
Soo	Squamish		2001	inactive	Jan-03	Low (too late)	
Strathcona	Campbell River	1996	1996/2001	active	Oct-02	CMT type of update done for TSR Med	DCR had quick disturbance tile done for 2002 TSR--not suitable as source for update Good candidate for new CMT
Sunshine Coast	Sunshine Coast		2001	active	Jun-04	Low	
Williams Lake	Chilcotin		2001	active	Sep-05	Low	
Williams Lake	Horsefly		2001	active	Sep-05	Low	
Williams Lake	Williams Lake		2001	active	Sep-05	Low	

	Analysis & AACs may be extended therefore inventory files will not be required
	indicates MOF office scheduled for closure
	indicates update is over 3 years old
	indicates data conversion still in progress in 2002
	indicates Change Management Tile only

Lignum IFPA - Photo interpretation complete, ground sampling complete

Adams Lake IFPA - Ground sampling complete

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Lignum IFPA - Photo interpretation complete, ground sampling complete

Adams Lake IFPA - Ground sampling complete

APPENDIX L: INDUSTRY RESPONSE TO OPTION 2

March 24, 2003

Rick Baker
Project Manager
Vegetation Cover Update
Ministry of Sustainable Resource Management

Re: Vegetation Inventory Update Strategy Report

Rick,

Although we are in general agreement with the recommendations in the report, it is unfortunate that after three months of work we are faced with such a tight timeline to review and respond to the draft Vegetation Inventory Update Strategy Report. Given this short review period we will confine our comments to that of the recommended mid to long-term option outlined in the report.

Our understanding around Option 2 is that it relies completely on information coming from RESULTS. The use of RESULTS has been assumed by the MSRM and MOF for the creation of this report and has not been endorsed by industry. If implementation of delivering spatial cut block information using RESULTS does not occur as planned we believe Option 2 is no longer valid and a new option will need to be explored. We do not agree that any of the alternative options outlined in the report are feasible in the mid term, nor do we believe that relying on legislation specifically to address vegetation process is an adequate solution.

There is very little work in the document that describes a substantive business case analysis around selecting Option 2. Although we agree that Option 2, or a variation of it, is an appropriate option, we feel there is a need to examine the pros/cons in more detail to ensure that both government and industry's business requirements will be met. We were to come up with a recommendation that did not add cost to industry. It will cost the industry to implement and use RESULTS, so a stable, long-term cost recovery mechanism must be established. This needs to be part of the report. The simple statement that "the added cost to industry is unknown", is not acceptable.

We are concerned that in recommending Option 2 a number of uncertainties are still left unanswered. Some of these uncertainties are very technical in nature, whereas many others are around existing business processes found in industry. We realize that the document does mention the presence of these uncertainties but feel that not enough

significance is placed on them. As the potential downfall of this Option will likely be due to some of these uncertainties it is critical that industry continues to play a role in the potential implementation of this Option.

We remain very concerned around the development of standards associated with the recommended Option. We stress that any standards that are to be developed in the future are done while considering both government and industries business needs. Industry must be involved in this process and we urge MSRM to considering using the Inventory and Information Management Working Group (or similar group) in developing these standards. This must be clarified in the Policy sections of the options.

In summary, it is disappointing that there was not more time to flush out this option. There are uncertainties regarding the implementation of this option that need to be explored before any major, and costly, work is undertaken in developing "tools" for the Integration Process.

Submitted by the Vegetation Update Task Team Industry Representative

Holding Area For Tables